

COUNTWAY LIBRARY



HC 4XCU M

# Wood's Medical Hand Atlases

Obstetric Diagnosis and Treatment  
by  
O. Schaeffer, M.D.



## WOOD'S MEDICAL HAND ATLASES.

---

MESSRS. WM. WOOD & Co.

Have the pleasure of announcing a series of Atlases upon various branches of medical and surgical science, which for accuracy, beauty, and

*BOSTON*

*MEDICAL LIBRARY*


*8 THE FENWAY*

...each contain from 50 to 100 or more full page plates, many of them comprising several figures, together with appropriate descriptive text and a condensed outline of the subject to which it is devoted. These books are uniformly about five by seven and a half inches in size, most convenient for ready use and reference. The descriptive matter for each plate is always printed on the page facing it, for convenience of study.

For the subjects covered by the volumes now offered to the profession, see inside of back cover.







Digitized by the Internet Archive  
in 2025



ANATOMICAL ATLAS  
OF  
OBSTETRIC DIAGNOSIS  
AND  
TREATMENT

BY   
OSCAR SCHAEFFER, M.D.

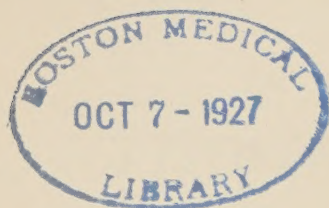
---

WITH 145 ILLUSTRATIONS

---

NEW YORK  
WILLIAM WOOD AND COMPANY  
1896

**DUPLICATE.**



25.A.121.

## PREFACE.

---

THIS volume deals with the morphology of the female pelvic organs, as the anatomical basis of the physiological and pathological phenomena of pregnancy and labor. I have tried throughout to point out how and why the processes of pregnancy, of the mechanism of labor, etc., are to be explained by the morphological conditions. From these are deduced the points utilized in diagnosis. Then follows the anatomical discussion of the pathologically altered sexual organs, with the changes they produce on the course of pregnancy and labor; and, inversely, the pathological changes in these organs that may be effected by abnormal pregnancies and labors *per se*. From these in turn are deduced the diagnostic points and the indications for treatment. We deal with anatomical conditions, formation of the diagnosis, the indication for treatment, the general features of which we also consider. I do not present a collection of various theories, but formulate only established doctrines corresponding to the most recent knowledge; wherever possible I have endeavored to decide in favor of one or another view from personal observation.

My intention is to explain the course of development in symptomatology and therapy by terse diction, often in tabular and parallel form, and by nu-



merous illustrations selected in harmony therewith. In this connection I beg to offer my warmest thanks to my esteemed teacher and former chief, Professor von Winckel, for the charming readiness with which he assisted me by his advice, by his revision of the plates, and by placing at my disposal the rich material of the gynecological clinic of the Munich University.

The development and pathology of the ovum have been sketched but briefly, and only so far as they are of actual clinical interest with reference to pregnancy and labor.

The secondary pathological sequelæ of labor, that is, the puerperal diseases not due immediately to labor, form a chapter of my "Atlas of Gynecology."

At the end I have given the most useful obstetrical remedies, with their dosage and therapeutic indications and directions for antisepsis.

It also becomes my pleasant duty to call attention to the fact that without the generous support of the publishers it would have been impossible for me to present so large a collection of original drawings in instructive color print.

The draughtsman to the University, Mr. C. Krapf, has made the drawings after my direction, with faithful attention to the anatomical and microscopical appearances of the preparations.

OSCAR SCHAEFFER, M.D.

# CONTENTS.

---

PREFACE, . . . . .	PAGE iii.
EXPLANATORY NOTE, . . . . .	xiii.
INTRODUCTION, . . . . .	xv.

---

## PART I.

### THE NORMAL ANATOMY OF THE SEXUAL ORGANS DURING PREGNANCY.

CHAPTER I.—THE NORMAL FEMALE PELVIS AND ITS DE- VELOPMENT, . . . . .	57
§ 1. The Diagnosis of the Normal Female Pelvis (illus- trated by Figs. 1, 4-7, 11, 25, 32), . . . . .	57
§ 2. The Form and Inclination of the Normal Female Pelvis (illustrated by Figs. 1, 10, 12-15, 17, 25-27, 32-32 <i>b</i> ), . . . . .	60
§ 3. Practical Conclusions (illustrated by Figs. 25, 26, 32), . . . . .	62
§ 4. The Fully Developed Normal Female Pelvis (illus- trated by Figs. 1, 12, 13, 17), . . . . .	63
§ 5. Diameters and Measurements of the Normal Female Pelvis (illustrated by Figs. 1, 6, 11, 16, 18, 22-24, 33), . . . . .	65
Supplement—The Fœtal Head (illustrated by Figs. 69-71, 116, 117), . . . . .	70
CHAPTER II.—THE NORMAL GENITAL TRACT DURING PREGNANCY, . . . . .	72

§ 6. The Diagnosis of Pregnancy (illustrated by Figs. 8, 9, 19, 21, 29, 40, 92-94, 101), . . . . .	72
§ 7. The Diagnosis and Anatomy of the Different Months of Pregnancy. Hyperemesis Gravidarum. Length of Ovum and Child (illustrated by Figs. 8, 29, 40, 118, 119, 122), . . . . .	75
§ 8. The Anatomy of the Lower Uterine Segment (illustrated by Figs. 17, 28, 30, 31, 52, 102-104, 127), . . . . .	78
§ 9. The Cervix During Pregnancy (illustrated by Figs. 8, 9, 29), . . . . .	81
§ 10. The Anatomy of the Uterine Body, and the Structural Changes of its Muscular Coat During Pregnancy and the Puerperium (illustrated by Figs. 35-37, 43, 45, 118, 121), . . . . .	82
§ 11. The Attitude of the Fœtus in Utero and the Compression Force of the Uterine Walls (illustrated by Fig. 18), . . . . .	84
§ 12. Normal Labor and the Relative Frequency of the Different Positions. Support of the Perineum and other Manipulations (illustrated by Figs. 96, 99-101, 116), . . . . .	85
§ 13. The Uterine Vessels and their Changes During Gestation (illustrated by Figs. 38, 41-43), . . . . .	88
§ 14. The Nerves of the Uterus. Causes of Uterine Contractions (illustrated by Fig. 39), . . . . .	89
§ 15. The Ligaments of the Internal Genitals and the Pelvic Connective Tissue (illustrated by Figs. 28, 30, 31, 34, 38, 43, 46), . . . . .	90
§ 16. The Ovaries and Fallopian Tubes and their Changes During Gestation (illustrated by Figs. 44, 46-48, 50, 51), . . . . .	92
§ 17. Vagina and Vulva and their Changes During Pregnancy. Vaginal Secretion. Lochia (illustrated by Figs. 30, 31, 33, 40, 53-55), . . . . .	95
§ 18. The Mammæ and their Changes During Pregnancy. Colostrum. Composition of Human Milk (illustrated by Figs. 49, 56, 57), . . . . .	99



	PAGE
§ 19. The Changes in the Non-Sexual Organs in Pregnancy and the Puerperium, . . . . .	101
§ 20. The Physiology of the Puerperium. Diet, . . . . .	103
§ 20a. The Physiology of the Child, . . . . .	104

---

## PART II.

### PELVIC DEFORMITIES AND THEIR INFLUENCE UPON PREGNANCY AND LABOR.

§ 21. The Diagnosis and Therapy of the Deformed Pelvis (illustrated by Figs. 69-71). Rupture of the Pelvic Articulations. Expectant Treatment. Indications for the Several Operations, . . . . .	105
§ 22. The Generally Contracted Pelvis (illustrated by Fig. 2). Tables for the Induction of Premature Labor and the Indications for Forceps and Perforation, . . . . .	111
§ 23. The Justo-Minor Pelves: Flat, Non-Rachitic, Flat-Rachitic, Simple and Generally Contracted (illustrated by Figs. 6, 11, 60, 61, 63, 67, 69-71, 78, 85, 89, 92-94, 101), . . . . .	112
§ 24. Compressed Pelves, Pseudo-Osteomalacic and Malacic (illustrated by Figs. 64-68, 70), . . . . .	119
§ 25. Funnel-Shaped Pelves, Lumbo-Sacral Kyphotic, Kypho-Scoliotic, Obtecta s. Spondylizema (illustrated by Figs. 3, 5, 72-74), . . . . .	122
§ 26. Obliquely Deformed Pelves, by Scoliosis, Synostosis, Coxalgia (illustrated by Figs. 77-79, 81), . . . . .	127
§ 27. Transversely Contracted Pelves (illustrated by Fig. 111), . . . . .	134
§ 28. Pelvis Changed by Congenital or Early Acquired Defects: Luxations, Bilateral Club-Foot, Fissured Pelvis, Pelvis of Recumbency (illustrated by Figs. 3, 82, 83), . . . . .	135

	PAGE
§ 29. Spondylolisthetic Pelves (illustrated by Fig. 80), . . . . .	137
§ 30. Pelves of Assimilation (Interposed Vertebra) (illustrated by Figs. 74, 75), . . . . .	139
§ 31. Pelves Contracted by Bony Tumors or Exostoses from Fractures. Acanthopelys (illustrated by Figs. 89-91), . . . . .	140
§ 32. Too Wide Pelves. Precipitate Labor (comp. § 55), . . . . .	141

### PART III.

#### DISPLACEMENTS, TUMORS, AND ANOMALIES OF DEVELOPMENT OF THE SEXUAL APPARATUS AND THEIR INFLUENCE UPON PREGNANCY AND LABOR.

CHAPTER I.—DISPLACEMENTS OF THE UTERUS, . . . .	142
§ 33. Anterior Displacements and Pendulous Abdomen (illustrated by Figs. 9, 29, 69, 70, 92-94, 101, 129), . . . . .	142
§ 34. Backward Displacements of the Uterus. Retroversion and Retroflexion of the Gravid Uterus (illustrated by Figs. 85-87), . . . . .	144
§ 35. Prolapsus of the Gravid Uterus (illustrated by Figs. 28, 30, 31, 34, 88), . . . . .	145
§ 36. Hernia of the Gravid Uterus or Hysterocele (illustrated by Fig. 95), . . . . .	146
CHAPTER II.—TUMORS OF THE GENITAL APPARATUS, . . . .	147
§ 37. Fibro-Myomata of the Uterus (illustrated by Figs. 96, 97, 107), . . . . .	147
§ 38. Carcinoma of the Uterus (illustrated by Fig. 106), . . . . .	150
§ 39. Obstructions to Labor in the Soft Parts of the Parturient Canal (illustrated by Figs. 96, 99). Vaginal Tumors, Hæmatoma, Cystocele, Vagina	

	PAGE
Septa, Atresiaë, Stenoses, and Rigidity of the Cervix, Vagina, and Vulva, . . . . .	151
§ 40. Ovarian Tumors (illustrated by Figs. 88, 97), . . . . .	152
CHAPTER III.—DEVELOPMENTAL ANOMALIES OF THE GENITAL APPARATUS, . . . . .	154
§ 41. The Influence of Developmental Anomalies of the Uterus upon Pregnancy and Labor (illustrated by Figs. 99, 100). Uterus Bicornis, Unicornis, etc., . . . . .	154

---

## PART IV.

§ 42. Rupture of the Uterus During Pregnancy and Labor (illustrated by Figs. 69-71, 98, 100, 102-107, 140), . . . . .	156
§ 43. Lacerations of the Cervix (illustrated by Fig. 38), . . . . .	161

---

## PART V.

### ABNORMAL IMPLANTATION OF THE OVUM; EXTRA-UTERINE PREGNANCY AND PLACENTA PREVIA.

§ 44. Tubal Pregnancy (illustrated by Figs. 46, 108-110, 112, 115, 126, 127), . . . . .	163
§ 45. Abdominal Pregnancy (illustrated by Figs. 113, 115), . . . . .	168
§ 46. Ovarian Pregnancy (illustrated by Figs. 47, 114), . . . . .	170
§ 47. Placenta Previa (illustrated by Figs. 28, 52, 96, 119, 133-135, 142), . . . . .	171



## PART VI.

ANATOMY AND ETIOLOGY OF THE PREMATURE  
EXPULSION OF THE OVUM.

	PAGE
§ 48. General Diseases of the Mother; Symptoms of Commencing Expulsion or Abortion. Decidual Hemorrhage, Placental Polypus, Blood Mole, Human Ova, Membranes, Decidua Cells, Chorionic Villi, Eclampsia, Placental Infarction, Torsion of the Funis, Maceration, Missed Labor (illustrated by Figs. 58, 59, 118-120, 122, 124-128, 130, 141, 142), . . . . .	177
§ 49. Diseases of the Endometrium and of the Fœtal Membranes. Endometritis, Hydrorrhœa of the Gravid Uterus, Decidua Polyposa, Vesicular Mole (illustrated by Figs. 92, 120, 121, 123, 124, 128-132, 141), . . . . .	183
§ 50. Diseases and Malformations of the Fœtus as Causes of Disturbances During Pregnancy and Labor. Syphilis, Melæna Neonatorum, Hydrocephalus, Double Monsters, etc., Multiple Pregnancy and Labor (illustrated by Figs. 136, 139-141), . . .	188

## PART VII.

§ 51. Abnormal Presentations, Positions, and Attitudes of the Child (comp. § 13). Diagnosis of all Presentations, Mechanism of the Abnormal Presentations, their Treatment (illustrated by Figs. 69-71), . . . . .	193
§ 52. Abnormal States of the Funis and Membranes During Labor. Coiling and Compression of the Cord, Velamentous Insertion, Retained Placenta,	

	PAGE
Premature Detachment of the Normally Im- planted Placenta (illustrated by Figs. 135, 139, 141), . . . . .	199

## PART VIII.

### DISTURBANCES OF LABOR CAUSED BY ABNORMAL UTERINE CONTRACTIONS AND BY GENERAL DISEASES OF THE MOTHER.

§ 53. General Remarks on Diagnosis and Operative Indications in Dystocia, . . . . .	202
§ 54. Reciprocal Effect between Pregnancy and Dis- eases of Non-Sexual Organs, . . . . .	205
§ 55. Abnormal Uterine Contractions. Excessive Contractions and Tetanus of the Uterus, Weak Contractions, Precipitate Labor (illustrated by Figs. 35, 36, 110), . . . . .	206

## PART IX.

### GENERAL OBSERVATIONS ON OBSTETRIC THERAPEUTICS.

CHAPTER I.—THE TECHNICAL APPARATUS, . . . . .	210
§ 56. Drugs Employed in Obstetric Practice, . . . . .	210
§ 57. General Preparations for Delivery and Antisepsis. Uterine Irrigations, . . . . .	216
CHAPTER II.—SURGICAL THERAPEUTICS, . . . . .	218
§ 58. Evacuation of the Uterus. Dilatation of the Cervix, Induction of Abortion and Premature Labor, . . . . .	218
§ 59. Surgical Obstetrical Manipulations. Perineal Incision, Suture of the Perineum, Incisions of the External Os, Cæsarean Section, Porro Operation (illustrated by Fig. 110), . . . . .	219

	PAGE
§ 60. General Remarks on Obstetric Operations. Preliminary Examination and Preparations, Version and Extraction, Changing Brow and Face Presentations, Expression and Various Manipulations, Reposition, Detachment of the Placenta, Extraction by the Shoulder (comp. §§ 12 and 51), Forceps Operations, Craniotomy, Cranioclasia, Exenteration, etc. (illustrated by Figs. 116, 139),	225



## EXPLANATORY NOTE.

---

EVERY figure has its description printed on the opposite page, where reference is made to the sections which bear on the illustration. At the head of every section of the text will be found the list of the illustrations discussed therein.

The table of contents, besides repeating the parts, chapters, and sections, also summarizes the subjects; this triple cross reference doing away with the necessity for an index.

The description of each figure refers to the numbers and letters specially chosen for it. Besides, in view of the many sagittal sections of pelves, a general series of numbers has been selected, which apply to all the illustrations of the pelves. A list of these numbers is appended:

- |                                |                                |
|--------------------------------|--------------------------------|
| 1, Symphysis.                  | 9, Spine of the ischium.       |
| 2, Promontory.                 | 10, Tuberosity of the ischium. |
| 2a, Double promontory.         | 14, Perineum.                  |
| 3, Coccyx.                     | 16, Umbilical cord.            |
| 4, Cervix uteri.               | 17, Placenta.                  |
| 4a, External os.               | 20, Rima pudendi.              |
| 4b, Internal os.               | 21, Lower uterine segment.     |
| 5, Bladder.                    | 26, Tumor.                     |
| 6, Vagina.                     | 27, Anterior superior spine.   |
| 7, Rectum.                     | 28, Wing of the sacrum.        |
| 7a, Anus.                      | 29, Sacro-iliac articulation.  |
| 8, Wall or body of the uterus. | 30, Ilio-pectineal eminence.   |
|                                | 31, Acetabulum.                |

32, Ilio-sacral ligament or posterior superior spine.	40, Lesser sacro-sciatic ligament.
33, Femur.	41, Greater sacro-sciatic ligament.
34, Anterior inferior spine.	42, Round ligament.
35, Obturator foramen.	43, Ovarian ligament.
37, Ovary.	44, Sagittal suture.
38, Oviduct.	45, Posterior fontanelle.
39, Broad ligament.	

## INTRODUCTION.

---

THE location and development of the ovum, like its birth, depend upon the position and condition of the maternal sexual tract and its neighboring organs, and ultimately upon the maternal organism as a whole. Apparently slight local diseases may give rise to pathological forms of the ovum that may result fatally, not only to the child but also to the mother during either pregnancy or labor.

One mother suffers from endometritis; the vascular walls of the diseased decidua rupture; decidual and subchorionic apoplexies develop, which cause the death of the embryo and abortion of the ovum. The serotinal remnants may slough, bringing death to the mother or many years of suffering from chronic parametritis or perimetritis, uterine displacements, etc.

Another mother also suffers from endometritis; the current toward the fundus produced by the cervical ciliated epithelium is arrested, or else a fibro-myoma renders the greater portion of the corporeal mucosa unsuitable for the reception of an ovum. The result is that the ovum becomes implanted too far down; placenta prævia occurs, with the danger of its laceration during the dilatation of the internal os, and threatening fatal hemorrhage.

Still another mother suffers from salpingitis; the chorionic infection has caused the cylindrical epithelium to swell and lose its cilia; the ovum is retained in the tube, where it is fertilized; a tubal pregnancy results, with all its serious consequences.

The vaginal secretion of a fourth mother is not acid in reaction as under normal conditions, but neutral or even alkaline, and swarms with streptococci. Immediately after labor fever sets in.

In another case again, the gravid uterus cannot rise above the projecting promontory of a flat rachitic pelvis; it remains retroflexed in the sacral excavation, grows, and compresses the neck of the bladder. Finally, this viscus ruptures and the decomposing urine escapes into the abdominal cavity.

This is a vicious circle: small causes, great effects.

The causes may also be inherent in the ovum, *i.e.*, transferred to it, unknown to us, by mother or father. The aplasia of the amnion, which is etiologically still unexplained, prevents the coalescence of the foetal tubules; large hernial sacs, fissures, and hydroceles develop on the skull, the spine, and the abdomen; or double malformations result from the division of an individual rudiment, or in a similar way there develop coccygeal tumors of muco-fibrous tissue, of a size often as large as the entire child; or a hydrocephalus forms—in short, the child loses the qualities of form and attitude which predispose to a cephalic presentation in the most favorable position: face, pelvic, or even oblique presentations arise.

How then must the maternal fruitful organism, how must the ovum and embryo be constituted, in order to produce the most favorable results?





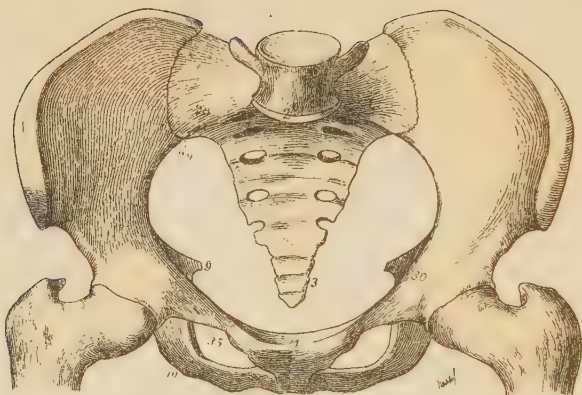


Fig. 1.

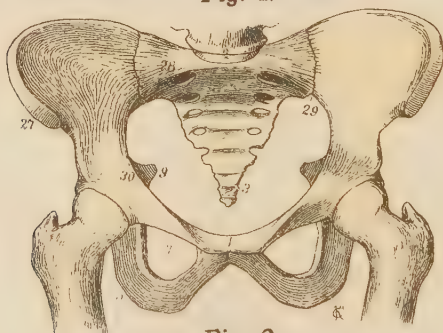


Fig. 2.

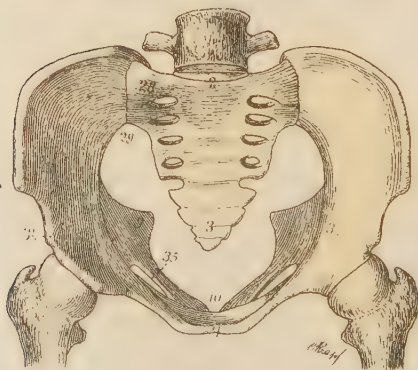


Fig. 3.

FIG. 1.—Normal female pelvis (front view). Text §§ 1, 2, 4, 5.

FIG. 2.—Generally contracted pelvis (justo-minor). Text § 22.

FIG. 3.—Funnel-shaped contracted pelvis of recumbency (*Liegbecken*) with foetal form. Text § 25.

Figs. 1-3 are original drawings after preparations at the Munich Gynecological Clinic.

Figs. 4*a* and *b*.—Measuring the external conjugate with the Baudelocque-Martin pelvimeter. Original drawing. Text § 1.

FIG. 5.—Measuring the transverse diameter of the outlet, after Breisky. Text §§ 1, 25.

FIG. 6.—Instrumental measurement of the true conjugate, after Skutsch. Text §§ 15, 23.



Fig. 4. a.

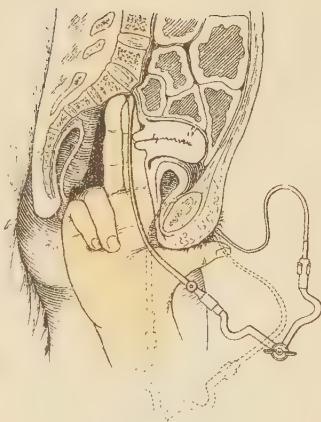


Fig. 6.

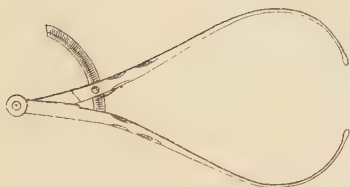


Fig. 4. b

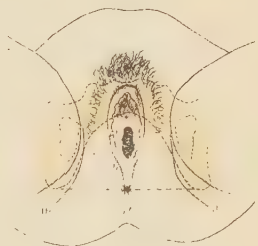


Fig. 5.







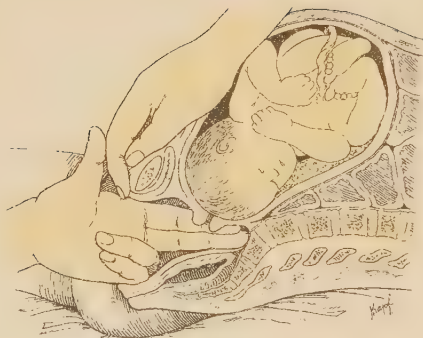


Fig. 7.



Fig. 8.

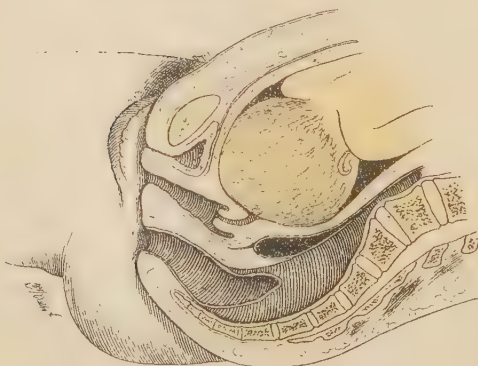


Fig. 9.

FIG. 7.—Digital measurement of the diagonal conjugate. Original drawing.  
Text § 1.

FIG. 8.—Backward direction of the cervix during pregnancy. Original drawing.  
Text §§ 6, 7, 9, 33.

FIG. 9.—Vertical forward direction of the cervix during pregnancy. Original drawing. Text §§ 6, 9.

FIG. 10.—Influence of the pressure of the thighs and of the traction of the ilio-sacral ligaments ( + the weight of the trunk) upon the form of the pelvis. After Schröder. Text § 2.

FIG. 11.—Instrumental measurement of the transverse diameter of the inlet, after Skutsch. Text §§ 1, 5, 23.

FIG. 12.—Sagittal section through the normal female pelvis. Original drawing after a preparation at the Munich Gynecological Clinic. Text §§ 2, 4.

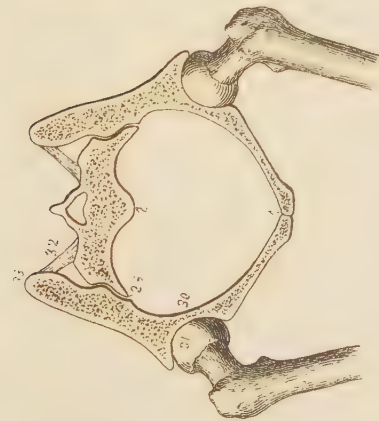


Fig. 10.

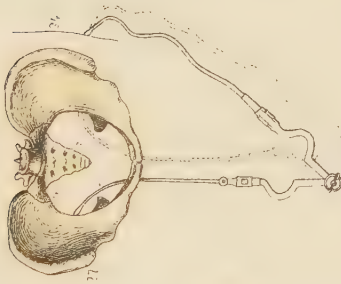


Fig. 11.



Fig. 12.







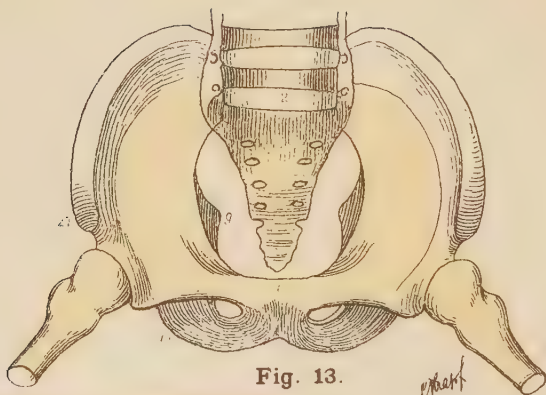


Fig. 13.

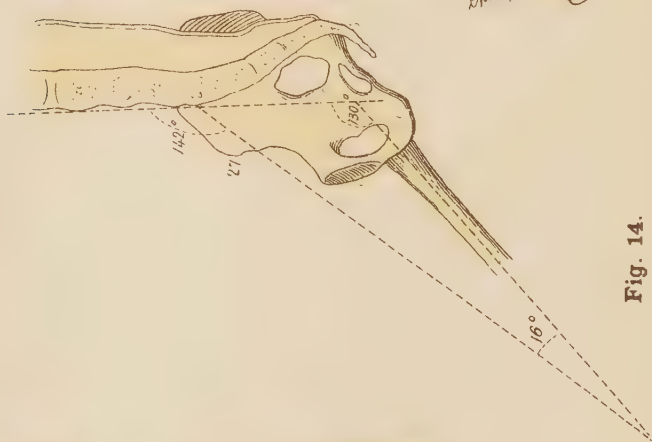


Fig. 14.

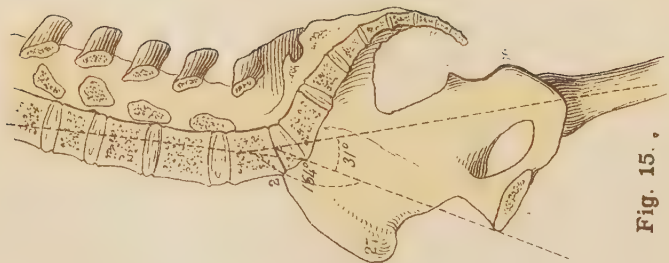


Fig. 15.

FIG. 13.—Foetal female pelvis (front view). Original drawing after a personal preparation. Text §§ 2, 4.

FIG. 14.—Angular direction of the thighs to the axis of the spinal column in the foetus.

FIG. 15.—Inclination of the axis of the thighs to that of the spinal column in the adult.

Figs. 14 and 15 after Balandin. Text § 2.

FIG. 16.—Palpation of the head in low position with reference to the ischial spines. Original drawing. Text § 5.

FIG. 17.—Sagittal section through the foetal pelvis, with the organs drawn in position from frozen sections. Original drawing after personal preparations. *P*, Vesico-uterine peritoneal fold; *P'*, recto-uterine peritoneal fold. Text §§ 2, 4, 8.

FIG. 18.—The fully dilated parturient canal, with the resistances and the course of the advancing head drawn in position. We see the coccyx receded and the soft parts of the perineum forming a prolongation of the slight concavity of the sacro-coccygeal wall. Modified from Hodge. Text § 5.



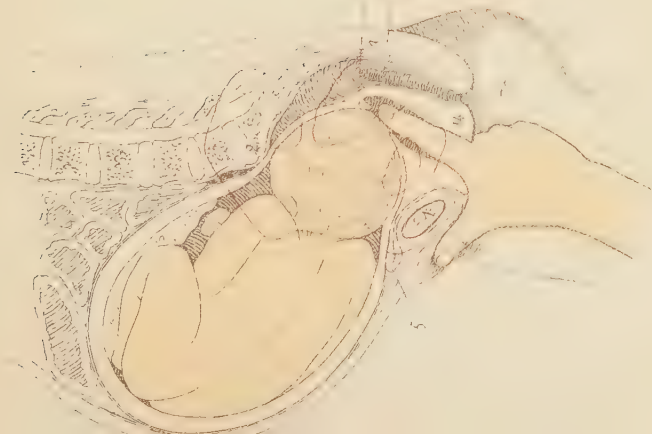


Fig. 16.



Fig. 17.



Fig. 18.







Fig. 19.

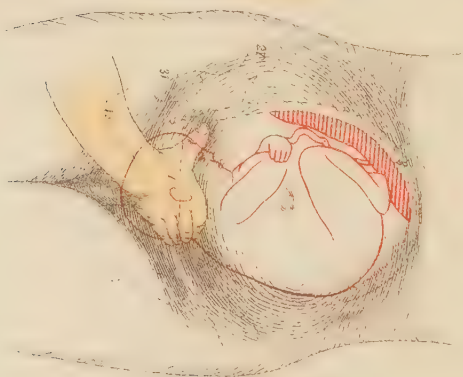


Fig. 20.



Fig. 21.

FIG. 19.—External examination of the position of the fundus and the direction of the back, or of the foetal extremities. Original drawing. Text § 6.

FIG. 20.—External examination of the position of the head before its entrance into the true pelvis. Original drawing. Text § 6. The head palpated as a hard body.

FIG. 21.—External examination of the head after its entrance into the true pelvis. Original drawing. Text § 6. Pressure from the sides into the true pelvis.

FIG. 22.—The pelvic inlet; its diameters and their normal average lengths, together with the muscles, modified after Veit. Text § 5. 1, Body of the first sacral vertebra; 2, symphysis; 5, obturator foramen; 6, head of the femur; 7, ilium; 8, iliacus muscle.

FIG. 23.—Veit's "main plane" passing through the lower margin of the symphysis parallel to the plane of the inlet. 1, Second and third sacral vertebræ; 3, iliopsoas muscle; 4, obturator internus muscle; 5, obturator membrane; the other numerals as in the preceding figure. Modified from Veit. Text § 5.

FIG. 24.—The width of the pelvic inlet. 4, Obturator internus muscle; 9, piriformis muscle. The cross indicates the point of intersection of the conjugate and the transverse diameter, which, therefore, is considerably farther forward than the greater transverse diameter at the inlet. Modified from Veit. Text § 5.



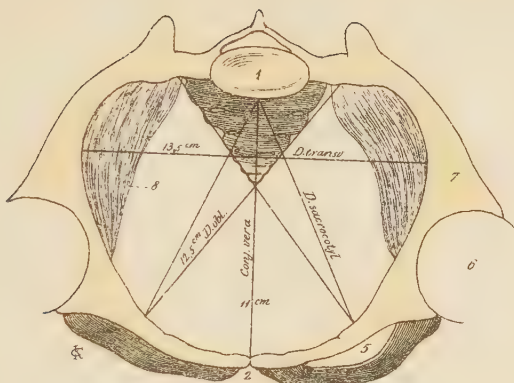


Fig. 22.

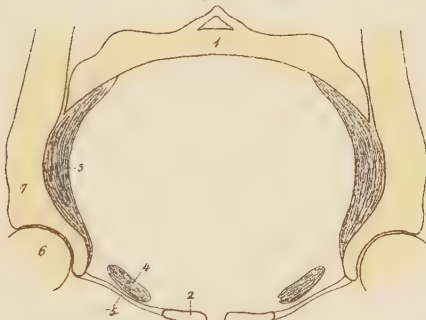


Fig. 23.

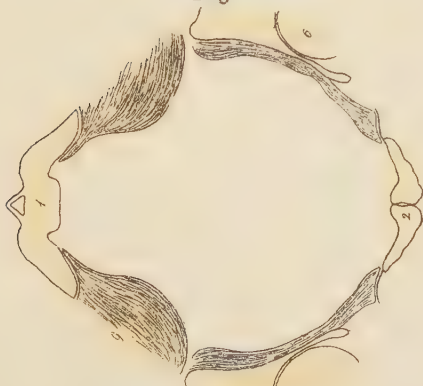


Fig. 24





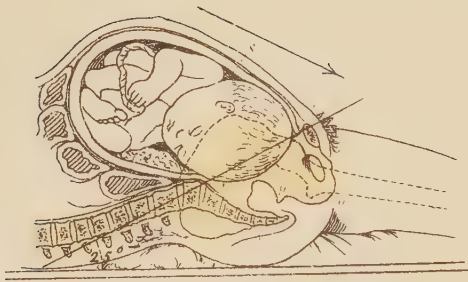


Fig. 25

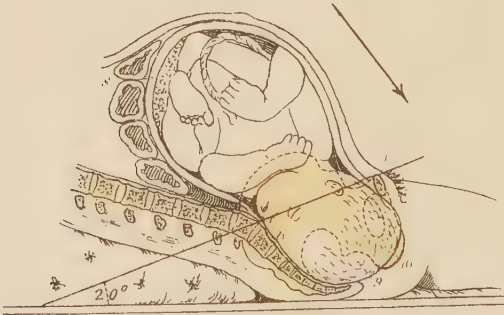


Fig. 26.

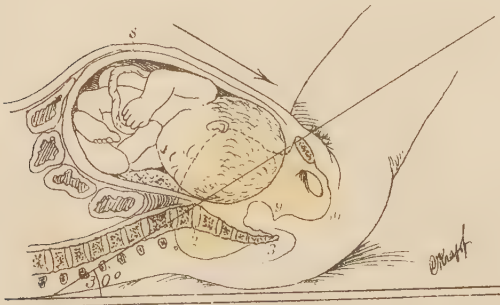


Fig. 27.

FIG. 25.—Inclination of the pelvis in various positions: in simple straight recumbency.

FIG. 26.—The same, with the trunk raised.

FIG. 27.—The same, with the thigh raised.

Figs. 25-27 original drawings. Text §§ 1, 2, 3.

FIG. 28.—The peritoneal relations of the normal genitals, and the division of the cervix uteri. Original drawing. Text §§ 8, 15, 35, 47. The anterior peritoneal fold of the vesico-uterine pouch reaches to the level of the internal os; the posterior fold of the recto-uterine pouch extends lower down in two divisions; the first division is formed by a protrusion at the level of the posterior vaginal fornix, which contains the retractores uteri muscles (extending to the sacrum); the second division is at the level of the external os. The cervix uteri is divided into three parts: 1, from the internal os to the posterior vaginal fornix = supravaginal portion; 2, from there to a parallel line through the anterior vaginal fornix = intermediate part; 3, the vaginal portion.

FIG. 29.—Position of fundus, cervix, and abdominal wall in the several months of pregnancy. After B. S. Schulze. Text §§ 6, 7, 9, 33.

Fig. 20.



Fig. 28.









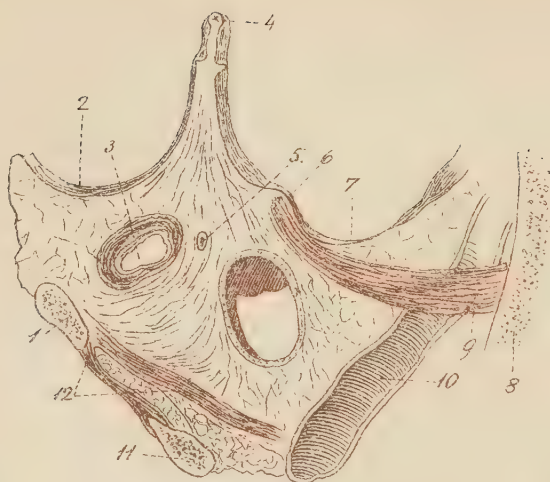


Fig. 30.

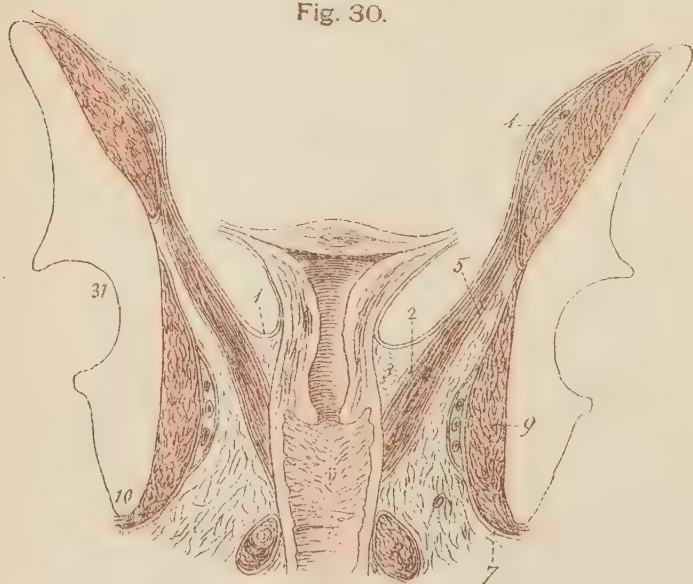


Fig. 31.

FIG. 30.—Sagittal section through the pelvis at the side of the uterus, through the broad ligament. Modified from Freund. Text §§ 8, 15, 17, 35. 1, Horizontal ramus of the os pubis; 11, ascending ramus of the ischium; 2, vesico-uterine pouch; 3, bladder; 4, transverse section of oviduct; 5, ureter; 6, the peritoneal protrusion of the recto-uterine pouch mentioned in Fig. 28 (= 7) with the attachment to the sacrum (= 8) of the retractores uteri muscles (= 9); 10, rectum. Through the opening made we get a view into the vagina with the vaginal portion of the cervix.

FIG. 31.—Frontal section transversely through the pelvis to show the muscles, fasciæ, and connective-tissue trabeculæ in the neighborhood of the genital tract. 1, Peritoneum; 2, upper and 5, lower layer of the fascia of the levator ani; 10, pelvis; 4, levator ani surrounding the vagina; 3, connective tissue above, and 6, below the levator ani or its fasciæ, 2 and 5; 7, obturator fascia; 8, constrictor vaginæ (continuation of the sphincter ani from the coccyx to the symphysis); 9, obturator internus muscle. Original drawing. Text §§ 8, 15, 17, 35.

FIG. 32.—Inclination of the pelvis in different positions: with the lumbo-sacral region elevated and the thigh drawn up.

FIG. 32*a*.—The same, with legs pendent. The depth of the pelvis becomes readily accessible for gynecological operations.

FIG. 32*b*.—The same, in the knee-elbow position.

Figs. 32–32*b* original drawings. Text §§ 1, 2, 3.

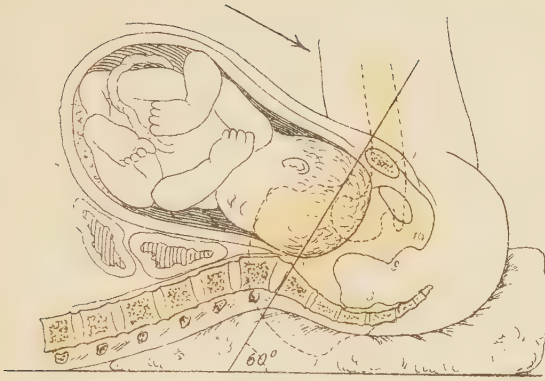


Fig 32.

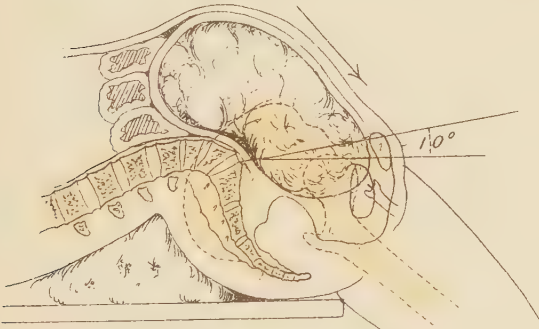


Fig 32. a

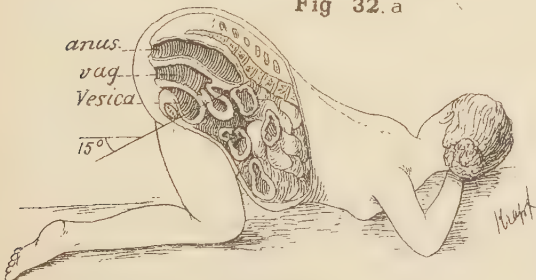


Fig 32. b.







Fig. 33.

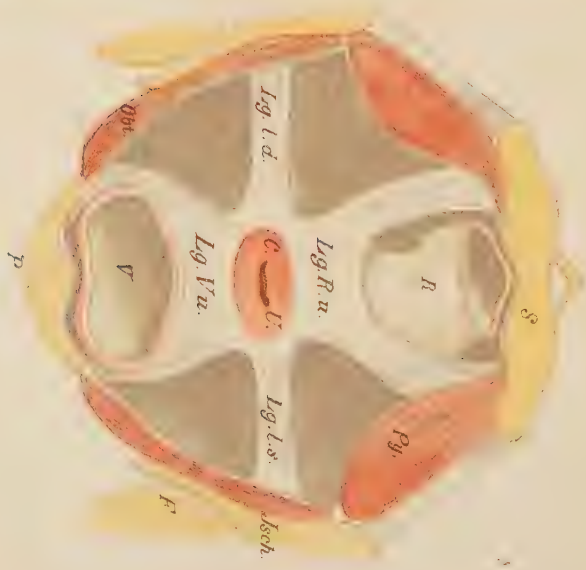


Fig. 34.



Fig. 33.—Muscles of the perineum. Original drawing, modified from Savage. Text §§ 5, 17. 1, *Gluteus maximus*; 2, levator ani; 3, sphincter ani; 4, obturator externus; 5, tuberosity of the ischium; 6, ischio-cavernosus with erector clitoridis; 7, constrictor vaginæ; 8, coccyx; 9, symphysis (with suspensory ligament of the clitoris); 10, Bartholinian gland; 11, anus; 12, vagina; 13, urethra; 14, the connective tissue numbered 6 in Fig. 31 with the fascia 7; 15, greater sacro-sciatic ligament.

Fig. 34.—Horizontal section through the pelvis at the level of the internal os, modified from Freund. Text §§ 8, 15, 35. Six firm, tendinous ligamentous bands extend radially, forward (vesico-uterine ligament) to the bladder (*V*), laterally (right and left broad ligament) to the pelvic wall (*Iscb*), backward (recto-uterine ligament) to the rectum (*R*) and sacrum (*S*). Between them partly loose connective tissue, partly the peritoneal excavations. Laterally appear the pyriformes muscles (*Pg*) and the obturatores interni (*Obt*). *C. U.*, cervix uteri; *P*, os pubis.

FIG. 35.—Superficial layers of the uterine muscles. After Deville, from the atlas of Lenoir, Sée, and Tarnier. Text §§ 10, 55. *T*, Tube; *P*, cervix; *Lg.l.*, broad ligament.

FIG. 36.—Internal layers of the uterine muscles. From the same. Text §§ 10, 55. Lettering as before.

FIG. 37.—Arrangement of the muscular fibres, after Ruge. Text § 10.



Fig. 35.

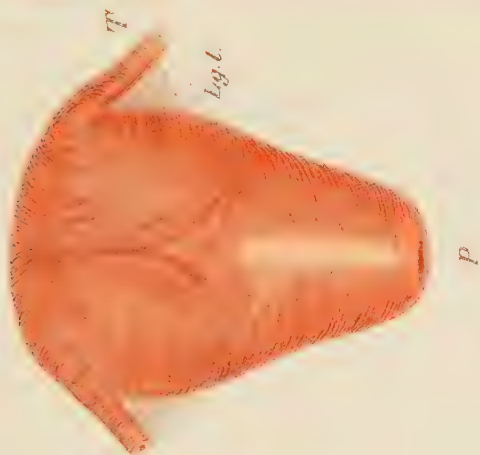


Fig. 36.

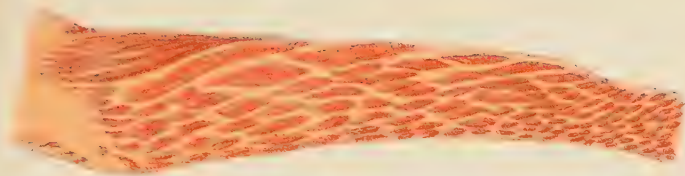


Fig. 37.





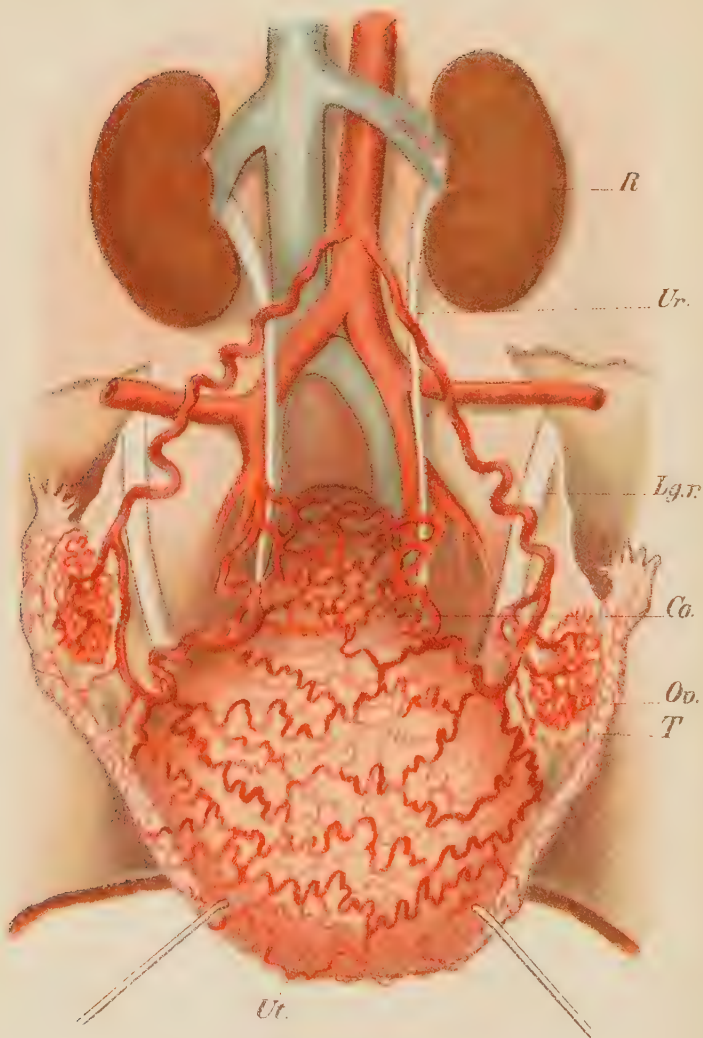


Fig 38

FIG. 38.—Course of the arteries of the uterus and of the ureters (*Ur*). Original drawing. *Ur*, ureter; *R*, kidney; *Ut*, uterus; *T*, tube;  *Ov*, ovary; *Co*, cervix; *Lg.r*, round ligament. Text §§ 13, 15, 43.

FIG. 39.—Nerve supply of the female genitals. Partly after Frankenhäuser, partly after Hirschfeld. Text § 14. 1, Hypogastric plexus of the aorta; 2, mesenteric plexus of the inferior rectus; 3, lumbar ganglion of the sympathetic; 4, spermatic plexus (from the renal and aortic plexuses) for tubes, ovaries, and fundus uteri; 5, branches of the third and fourth sacral nerves, forming with the ganglionic systems, 6, which supply the cervix uteri, the right inferior hypogastric plexus (uterine branches, the lower portion of the uterus supplied by the inferior hypogastric plexus, the middle portion by the inferior hypogastric plexus of the aorta, the fundus by the spermatic plexus and by isolated branches of the last two plexuses); 10, great sciatic nerve; 12, pudendal nerve; 13, continuation of the latter as the dorsalis clitoridis; *R*, rectum; *U*, uterus; *B*, bladder; *D*, transversus perinei muscle (cut transversely); *S*, ilium; *P*, os pubis; *Ur*, ureter;  *Ao*, aorta; *V*, vagina; *L.a*, levator ani; *Ov*, ovary; *T*, tube.

FIG. 40.—Color of the vulva, vagina, and vaginal cervix seen with the speculum. Original drawing. Text §§ 6, 7, 17. *P*, Vaginal cervix; *N*, nymphæ; *L.M*, labium majus; *Sp*, speculum.



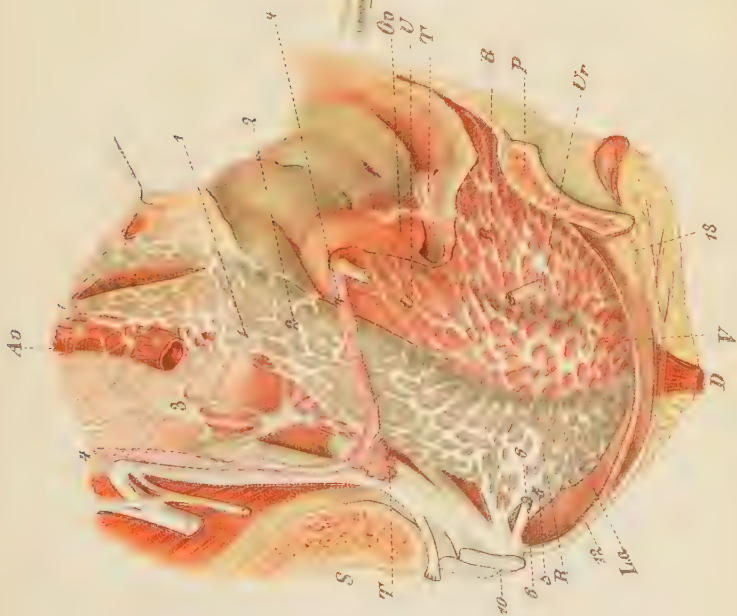


Fig. 39.

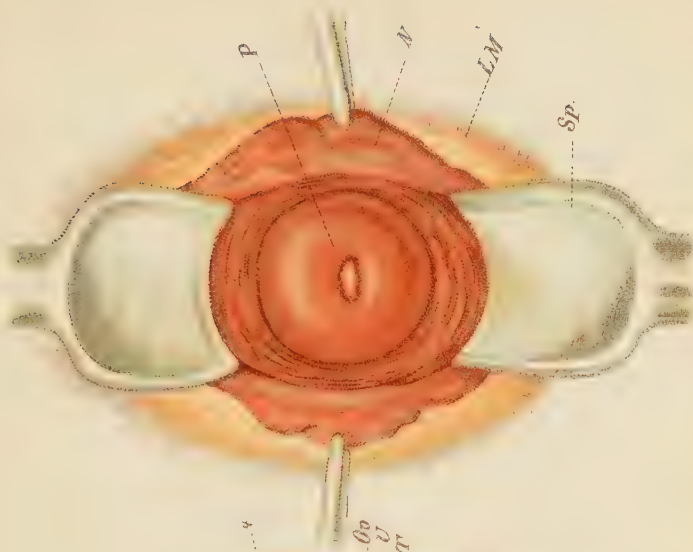


Fig. 40.







Fig. 41.



Fig. 42.

FIG. 41.—Course of the venous plexuses of the gravid uterus and the relation of the arteries to them. In part after Heitzmann's injected preparation. Text § 13. *T*, Tube; *Lg.l*, broad ligament; *Ut*, uterus; *P*, vaginal portion of the cervix; *V*, vagina.

FIG. 42.—Course of the lymphatics of the female genitals. After Poirier. Text § 13. *Ut*, Uterus; *Ov*, ovary; *T*, tube; *Lg.r*, round ligament; *Lg.l*, broad ligament; *P*, vaginal portion of the cervix; *V*, vagina.

FIG. 43.—Cross section through the fetal uterus at the level of the internal os (sixth month, microscopic, original drawing after a personal preparation). Text §§ 10, 13, 15. 1, Single layer of ciliated cylindrical epithelium, muciparous, with the primary glandular invaginations. The appearance of the lumen, complicated by the plicæ palmatæ, is characteristic of the cervical portion of the uterus. 2, The connective-tissue stroma of the mucosa, rich in round cells, especially at the margin of the gland. Radial course of the vessels. 3, The confused intermixture of muscular fibres, running chiefly circularly, pierced by vessels passing radially. 4, Subperitoneal connective tissue enclosing the vascular trunks derived from 6, the intraligamentous connective tissue with the main branches of the uterine artery. Between these are some transversely divided muscular bundles. 5, Peritoneal endothelium.

FIG. 44.—Cross sections through an oviduct at various points (microscopic). Original drawing after a personal preparation. Text § 16. *a*, Near the uterine ostium, well supplied with muscle fibres, mucosa containing few papillæ; *b*, through the isthmus, the mucosa forms four main papillæ; *c*, near the ampulla, few muscle fibres, numerous papillæ. 1, Peritoneal endothelium; 2, subserous connective tissue with vessels 4; 3, muscular coat, chiefly circular; 5, ciliated cylindrical epithelium.

FIG. 45.—Puerperal uterine wall (microscopic). Original drawing after a personal preparation. Text § 10. 1 and 2, Circular muscular fibres undergoing granular disintegration, between them loose oedematous connective tissue 4; 3, thick muscular fibres in transverse section; 5, large thick-walled vessel with red thrombosis and beginning formation of fibrinous coagula; 6, vessel in complete fibrinous thrombosis with lamellar arrangement; 9, large capillary vessels of the subdecidual portion of the mucosa already organized—connective tissue; 7, muscular fibres in angular contraction undergoing degeneration, with cells which do not stain; 8, large new capillary formations of pregnancy; 10, glands which during pregnancy have retained the cylindrical epithelium of their deeper parts; the epithelium is proliferating and covers the surface of the regenerating mucosa; 11, stroma of the mucosa with decidual cells still numerous; 12, 13, in an open thrombosed capillary space with decidua cells is a retained chorionic villus 14.

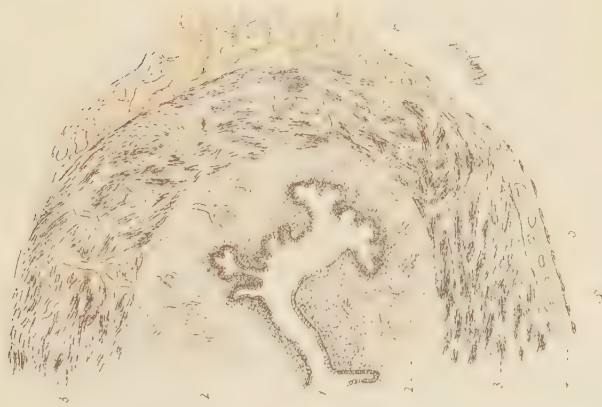


Fig. 43.



Fig. 44.

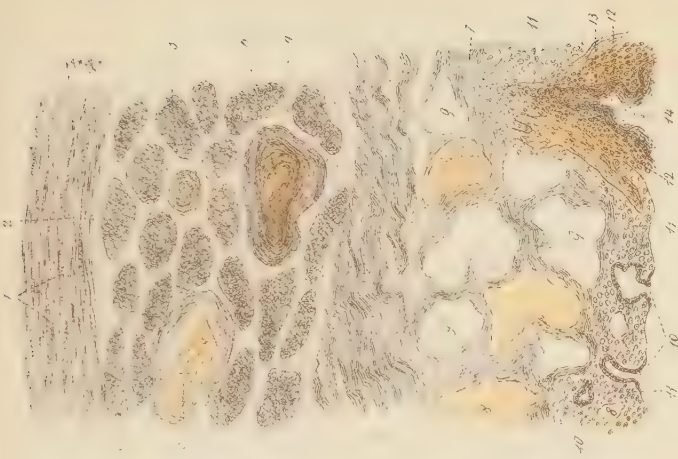


Fig. 45.







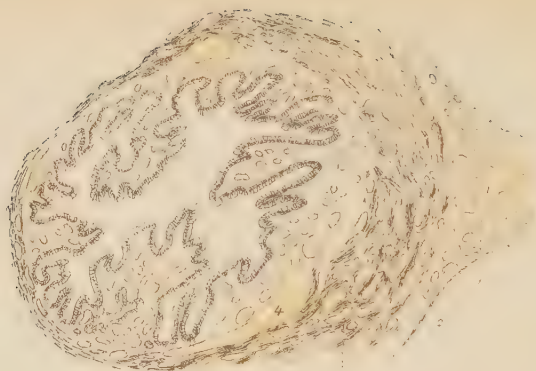


Fig. 46.



Fig 47.

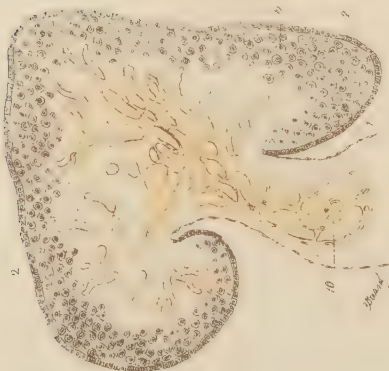


Fig 48.

FIG. 46.—Cross section through the isthmus of the oviduct during pregnancy (microscopic). Original drawing after a personal preparation. Text §§ 15, 16, 44. 1, Peritoneal endothelium; 2, very vascular subperitoneal connective tissue; 3, circular muscle with greatly dilated vessels; 4, vessel in longitudinal section; 5, cylindrical epithelium, forming with the stroma the characteristic principal papillæ existing since the fifth foetal month.

FIG. 47.—Longitudinal section through the ovary of a new-born infant (microscopic) with a ripe follicle. Original drawing after a personal preparation. Text §§ 16, 46. 1, Peritoneal endothelium sharply demarcated, changing at the hilus into 2, cuboidal germinal epithelium; 3, in the follicular epithelium (derived from the external germinal epithelium by invagination of Pflüger's tubules) an embedded ovum with zona pellucida, yolk, germinal vesicle, and germinal spot; 4, single-layered cell follicle with one ovum, at 7 with two ova; 5, capillary vessel; 6, primordial ova; 8, mature Graafian follicle, with fibrous theca folliculi, membrana granulosa, discus proligerus containing the ovum, and liquor folliculi, bulging out the surface of the ovary; 9, primary follicle with ovum. The remaining empty spaces bordered with cuboidal cells represent single-layered follicles in which the section did not strike the ovum. 10, Vessels entering the ovary at the hilus from the broad ligament, with intraligamentous connective tissue, and accompanied by lymphatics and nerves.

FIG. 48.—Cross section (vertical) through the ovary of a six months' foetus (microscopic). Original drawing from a personal preparation. Text § 12. Lettering as in the preceding figure.

FIG. 49.—Secreting lacteal gland cells. 1, Cylindrical cells undergoing fatty change; 2, spindle cells in the connective tissue; 3, blood-vessel; 4, efferent duct. Original drawing. Text § 18.

FIG. 50.—Ovary with recently ruptured follicle (*F*), adjoining it smaller follicles; the tube (*T*) adjoins the ovary (*Ov*). Original drawing. Text § 16.

FIG. 51.—Longitudinal section through an ovary with true corpus luteum and dilated vessels, the result of pregnancy. Original drawing. Text § 16.

FIG. 52.—Relation of the implantation of the ovum to the cervix uteri. Original drawing. Text §§ 8, 47. *M*, Müller's ring. The numerals refer to the general series.

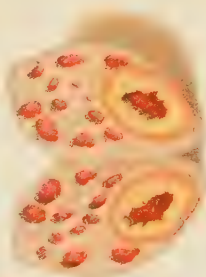
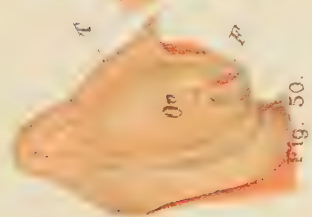
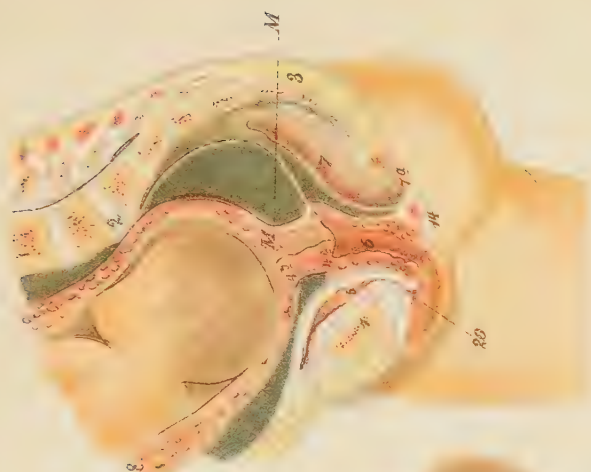








Fig. 53.



Fig. 54.



Fig. 55.

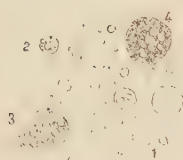


Fig. 56.

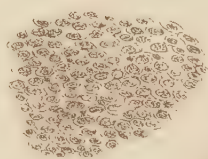


Fig. 58.

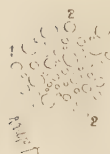


Fig. 57.



Fig. 59.



FIG. 53.—Lochia rubra. 1, Decidua cells; 2, pavement epithelia; 3, red corpuscles in rouleaux; 4, isolated red blood corpuscles; 5, white blood corpuscles; 6, scattered diplococci (microscopic).

FIG. 54.—Lochia alba. Numerals as before; the cells are granular (microscopic).

FIG. 55.—Lochia serosa. 6, Swarms of cocci; 7, granular, young, vesicular spindle cells (microscopic).

Figs. 53–55 original drawings after personal preparations. Text § 17.

FIG. 56.—Colostrum corpuscles, *i.e.*, cells undergoing fatty metamorphosis, discharging (microscopic).

FIG. 57.—Milk, consisting of fat globules (1) with leucocytes (2) (microscopic).

Figs. 56 and 57 original drawings. Text § 18.

FIG. 58.—Decidua cells (microscopic). Text §§ 44, 48. Large polygonal oval cells, multinuclear by active division, often of long spindle shape from the pressure of growth.

FIG. 59.—A chorionic villus with foetal blood-vessels (microscopic). Text § 48. Myxomatous connective tissue with single-layered cuboidal epithelium and foetal vessel.

Figs. 58 and 59 original drawings after teased preparations.

FIG. 60.—Flat, non-rachitic pelvis.

FIG. 61.—Flat, rachitic pelvis.

FIG. 62.—Generally contracted, flat, rachitic pelvis.

Figs. 60-62 original drawings after preparations at  
the Munich Gynecological Clinic. Text § 23.

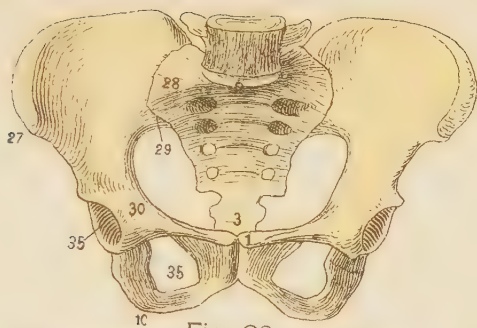


Fig. 60.

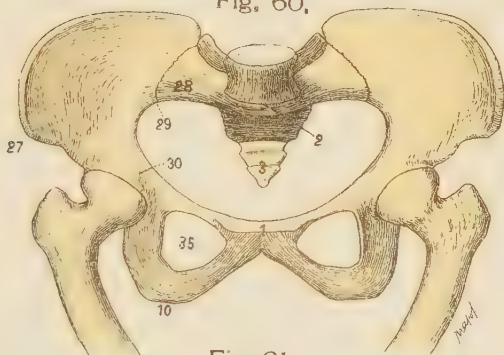


Fig. 61.

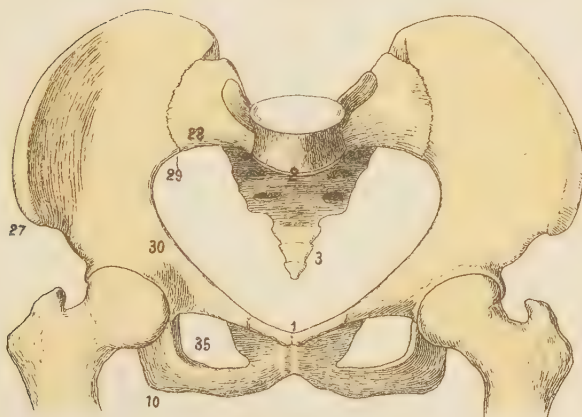


Fig. 62.





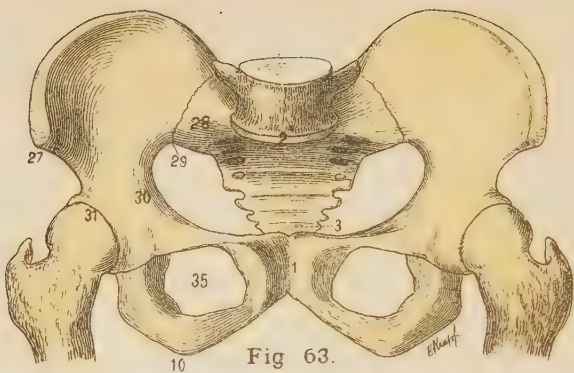


Fig. 63.

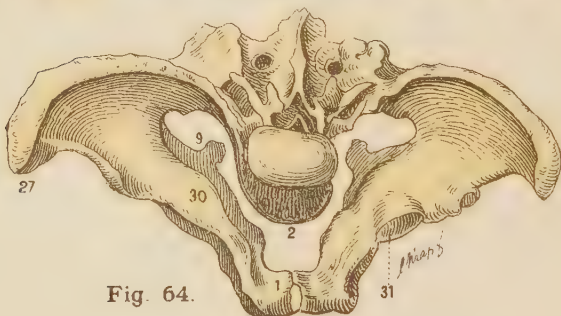


Fig. 64.

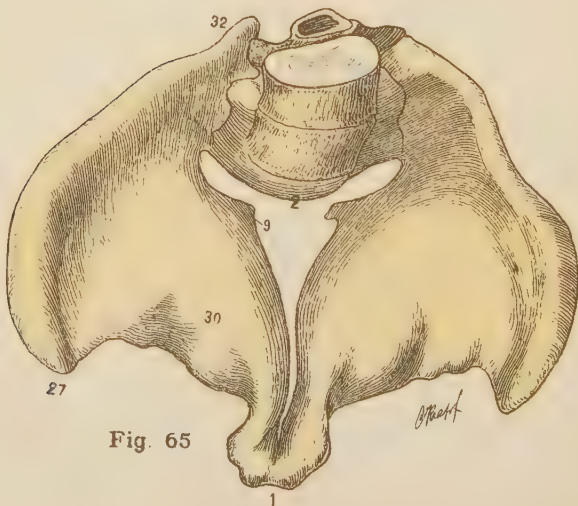


Fig. 65

FIG. 63.—Markedly flat, rachitic pelvis. Text § 23.

FIG. 64.—Contorted, rachitic, pseudo-osteomalacic pelvis. Text § 24. After Schröder.

FIG. 65.—Contorted osteomalacic pelvis. Text § 24.

Figs. 63 and 65 original drawings after preparations  
at the Munich Gynecological Clinic.

FIG. 66.—Centre of ossification of a normal epiphysis (microscopic). 1, Hyaline cartilage; 2, zone of beginning cartilaginous proliferation; 3, 3, columns of the erect cartilage cells; 4, columns of the enlarged cartilage cells; 5, zone of the first calcification; 6, layer of osteoblasts in the zone of the first bone formation; 7, finished cancellous tissue; 8 and 9, blood-vessels in transverse and longitudinal section.

FIG. 67.—Centre of ossification of a rachitic epiphysis (microscopic). 1, Transition of the unchanged hyaline cartilage into the proliferating; 2, zone of the erect columns of cartilage cells; 3, in the region of the proliferated and enlarged cartilage cells are cellulo-fibrous medullary spaces containing vessels; 4, calcified insular cartilaginous tissue; 5, trabeculae of osteoid and finished calcified osseous tissue; 6, trabeculae of osteoid uncalcified tissue; 7, same as 3 with vessel in transverse section.

FIG. 68.—Microscopic section through an osteomalacic bone. 1, Remnants of calcified bone substance; 2, decalcified bone substance; 3, larger medullary spaces resulting from atrophy of bone substance; 4, Haversian canals.

Figs. 66-68 copied after Ziegler. Text §§ 23, 24.



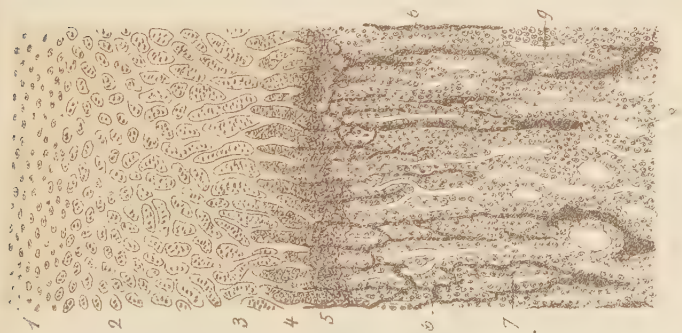


Fig 66



Fig. 67

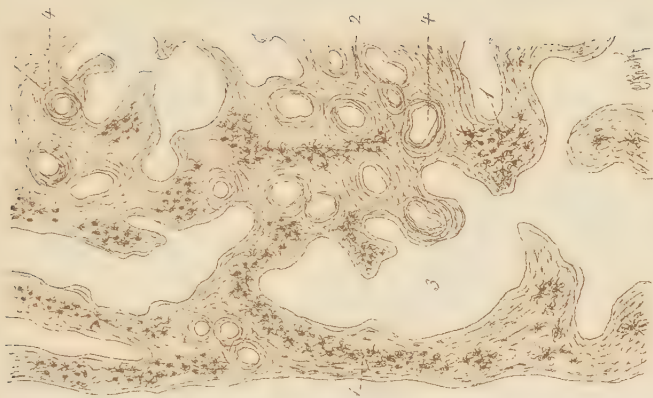


Fig. 68.





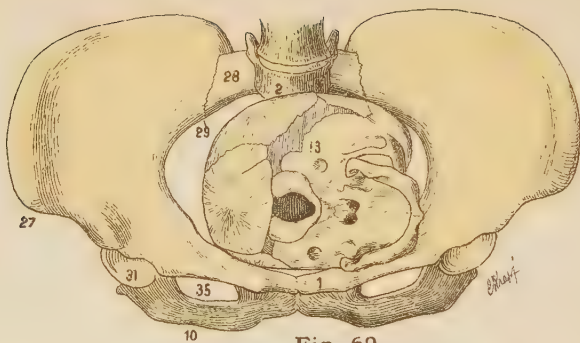


Fig. 69



Fig. 70

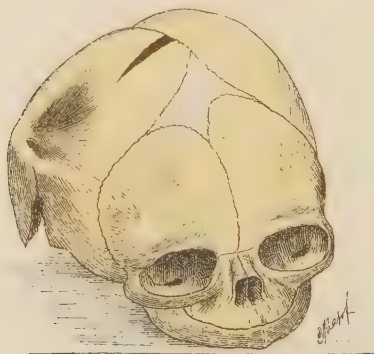


Fig. 71

FIG. 69.—Engagement of the head in the flat, rachitic pelvic inlet, in Nägele's obliquity. Left anterior parietal presentation. Text §§ 5 (appendix), 21, 23, 33, 42, 51.

FIG. 70.—The relative curvatures of the sacrum, when normal, in rachitis and in osteomalacia, with the changed position of the symphysis. Engagement of the head as in the preceding, seen in sagittal direction in the flat, rachitic pelvis. Text §§ 5 (appendix), 21, 23, 33, 42, 51.

FIG. 71.—The configuration of the skull resulting from the conditions described in Figs. 69 and 70: depressed fracture of the posteriorly situated parietal bone caused by the promontory, and characteristic bulging of the anteriorly situated left parietal bone. Text §§ 5 (appendix), 21, 23, 42, 51.

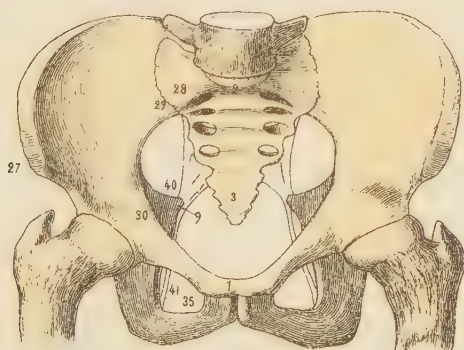
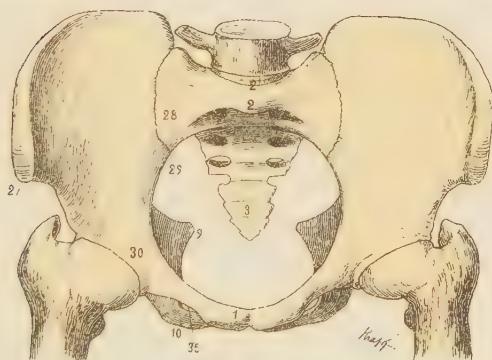
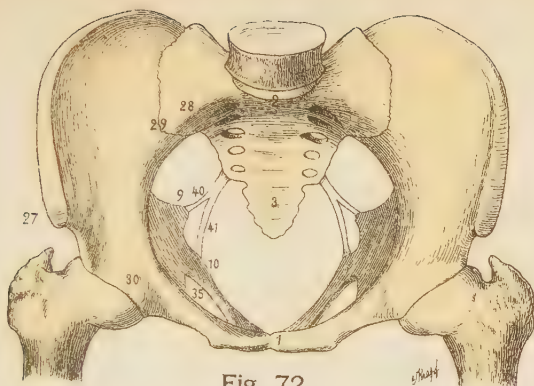
Figs. 69-71 original drawings after preparations at the Munich Gynecological Clinic.

FIG. 72.—Infantile funnel-shaped pelvis with symmetrically oval inlet and contracted outlet. Text § 25.

FIG. 73.—Kyphotic funnel-shaped pelvis with double promontory. Text § 25.

FIG. 74.—Rachitic-kyphotic funnel-shaped pelvis, with symmetrical, intercalated, or, better, transition vertebra of both sides. Text § 30.

Figs. 72-74 original drawings after preparations at the Munich Gynecological Clinic.









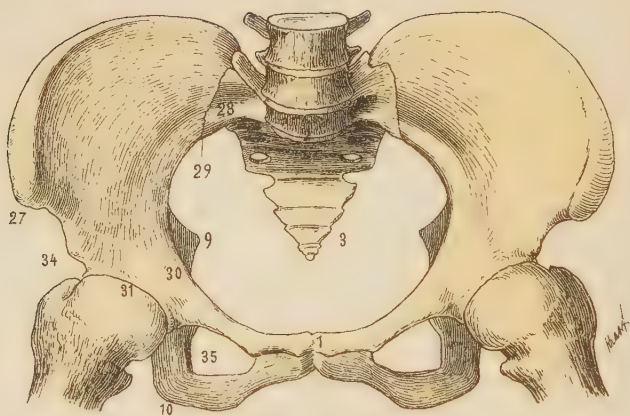


Fig. 75.



Fig. 76.



Fig. 78.

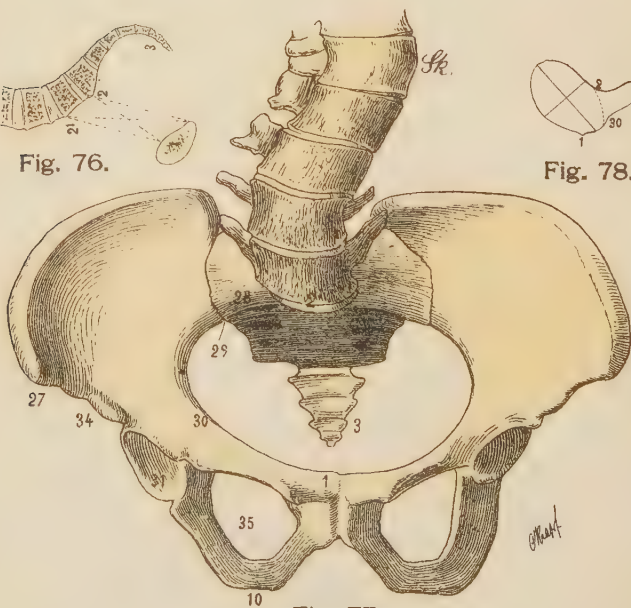


Fig. 77.

FIG. 75.—Asymmetric pelvis of assimilation, not obliquely distorted. The lumbo-sacral transition vertebra has a sacral form on the left and a lumbar form on the right. Text § 30.

FIG. 76.—Double promontory (sagittal section). Text §§ 25, 30.

FIG. 77.—Pelvis displaced toward the left by rachitic scoliosis (*Sk*); the lowest two lumbar vertebræ determine this compensatory direction. Text § 26.

FIG. 78.—Inlet of a pelvis displaced to the right, the left half representing a “dead” space for the passage of the head. Text §§ 23, 26.

Figs. 75–78 original drawings after preparations at the Munich Gynecological Clinic.

FIG. 79.—Pelvis obliquely distorted toward the right by ankylosis caused by a coxitis of the right side. Text § 26.

FIG. 80.—Spondyl-olisthetic pelvis. Text § 29.

FIG. 81.—Pelvis obliquely distorted toward the left by right synostosis of the wing of the sacrum. Text § 26.

Figs. 79–81 original drawings after preparations at the Munich Gynecological Clinic.



Fig 79.

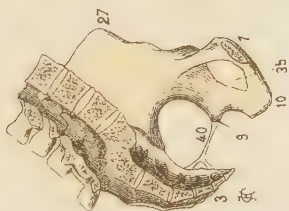


Fig. 80.

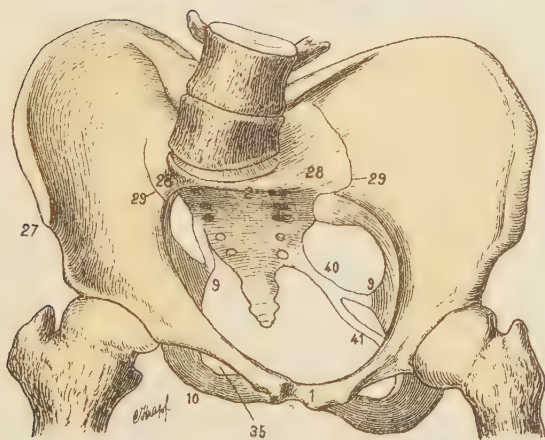


Fig. 81.





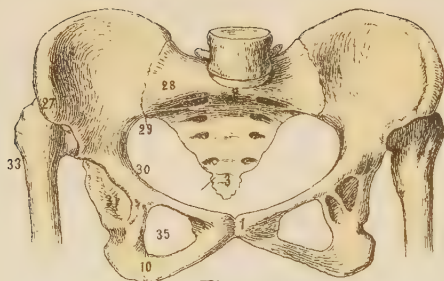


Fig. 82.

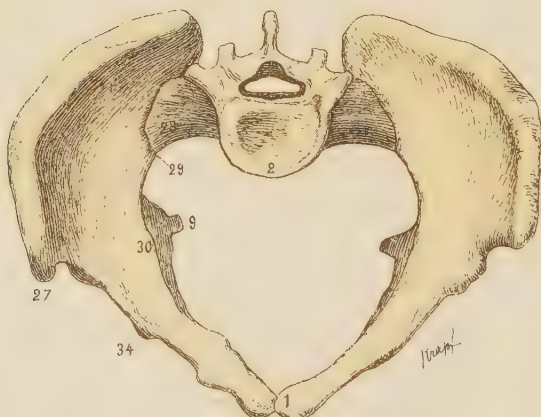


Fig. 83.

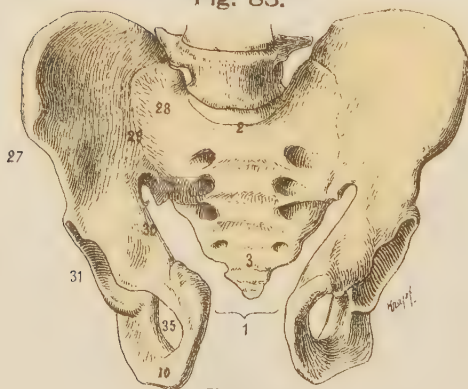


Fig. 84.



FIG. 82.--Pelvis sagittally contracted by bilateral luxation of the femurs backward and upward. After Schauta. Text § 28.

FIG. 83.—Transversely contracted sagittally oval pelvis the result of bilateral pes-varus position. After Schauta. Text § 28.

FIG. 84.—Fissured pelvis. After Schauta. Text § 28.

FIG. 85.—Retroflexion of the gravid uterus; owing to extreme ischuria and decomposition of the stagnating urine the entire mucosa of the bladder has become necrotic and has been detached in the form of a complete sac. Slightly modified from Schatz.

FIG. 86.—Partial retroflexion of the gravid uterus, resulting from a total incarceration.

Figs. 85 and 86 original drawings. Text §§ 23, 24.

Fig. 85.



Fig. 86.







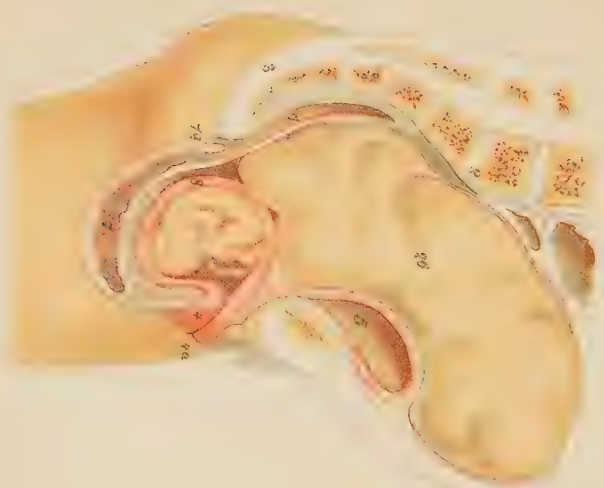


Fig. 88.

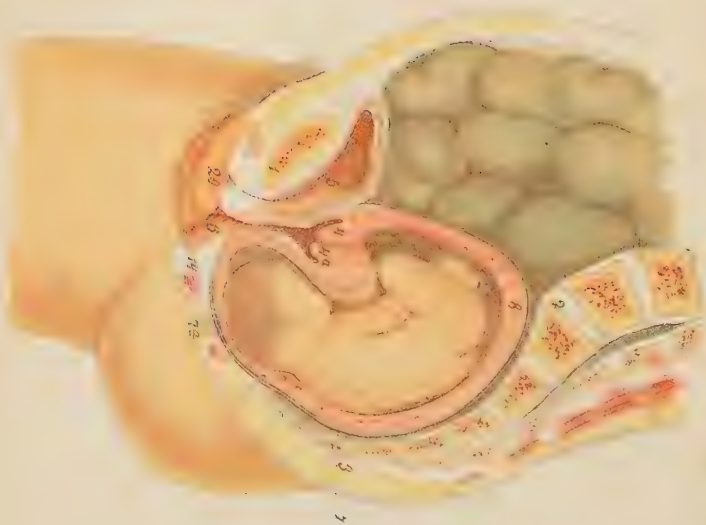


Fig. 87.

FIG. 87.—Transition to a prolapsus of a retroflexed gravid uterus, with perforation per rectum, per vaginam, or through the perineum. Text §§ 23, 34.

FIG. 88.—Total prolapsus of the retroflexed gravid uterus the result of pressure by a large left pedunculated ovarian cystoma filling the true pelvis and reaching as high as the navel; ischuria; rectocele. Text §§ 23, 35, 40.

Figs. 87 and 88 original drawings.

FIG. 89.—Acanthopelvis in rachitis, with bony spurs at the right ileosacral articulation (29) and at both ileopubic synostoses (30). Text §§ 23, 31. Original drawing after a preparation at the Munich Gynecological Clinic.

FIG. 90.—Fracture of the ilium with recovery resulting in an exostosis (*Ex*). After v. Winckel. Text § 31.

FIG. 91.—Cystic enchondroma seen from above (Behm's case). Original drawing from a cast. Text § 31.



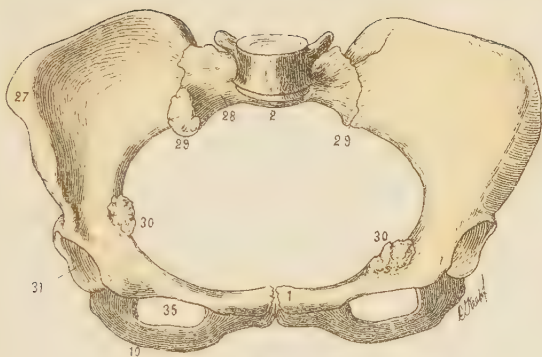


Fig. 89.

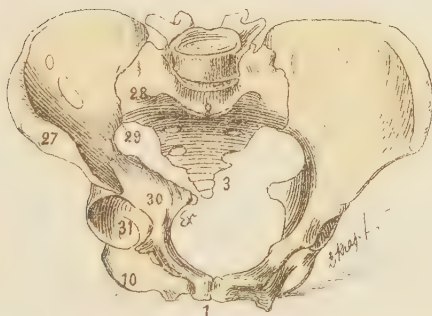


Fig. 90.



Fig. 91.





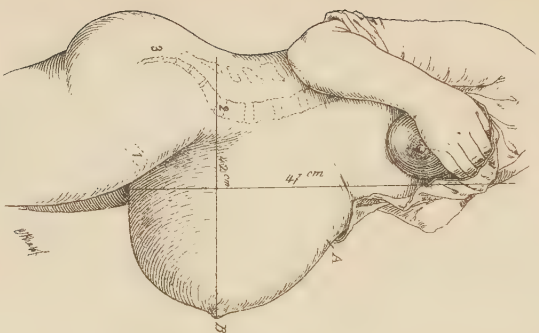


Fig. 92.

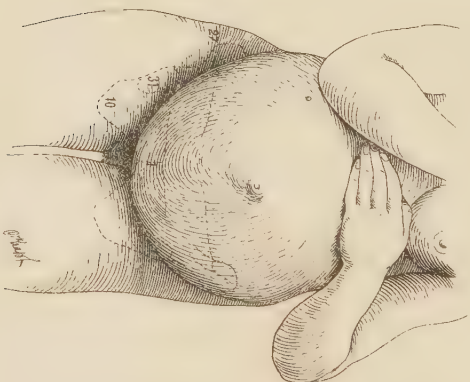


Fig. 93.

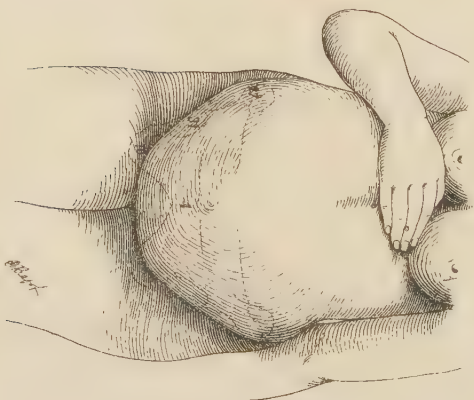


Fig. 94.

· FIG. 92.—Pointed abdomen with the limits of dulness marked, in a case of polyhydramnios from Küstner. Text §§ 6, 12, 23, 33, 49.

FIG. 93.—Pendulous abdomen, first degree. Text §§ 6, 12, 23, 33.

FIG. 94.—Pendulous abdomen, second degree. Text §§ 6, 12, 23, 33.  
Figs. 92-94 original drawings.

FIG. 95.—Winckel-Eisenhart's case of labial hernia of a gravid uterus bicornis. Text § 36.  $C^1$ ,  $C^2$ , horns of the uterus;  $S$ , uterine septum.

FIG. 96.—Face presentation resulting from a cervical fibromyoma, detached from the wall and delivered first. Placenta previa marginalis. Text §§ 12, 37, 47.

Figs. 95 and 96 original drawings, Fig. 96 after a preparation at the Munich Gynecological Clinic.

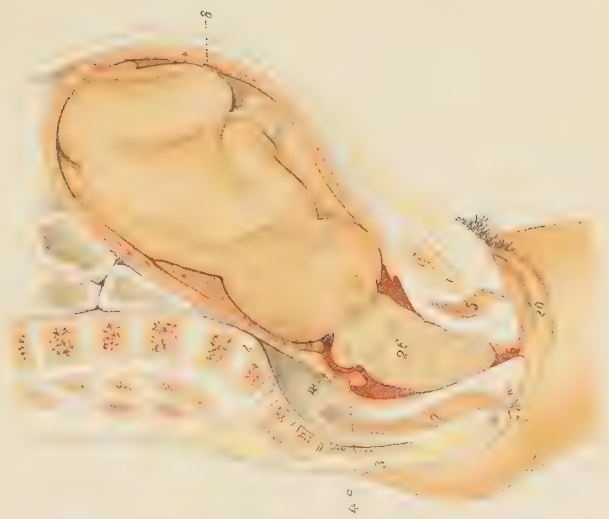


Fig. 96.



Fig. 95.







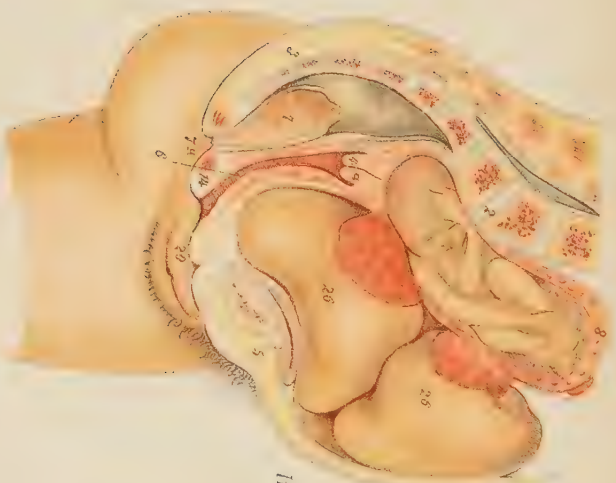


Fig. 97.



Fig. 98.

FIG. 97.—An enormous subperitoneal uterine myoma preventing the entrance of the foetus into the true pelvis and keeping it in abnormal position and attitude. Text §§ 37, 40.

FIG. 98.—Incomplete uterine rupture (*Ku*) of the distended lower posterior uterine segment in the region of the internal os, with the formation of a subperitoneal hæmatoma (*Häm*) in Douglas' pouch. Text §§ 8, 42. *Pl*, placental site.

Fig. 97 original drawing, Fig. 98 after a preparation at the Munich Gynecological Clinic.

FIG. 99.—Uterus bicornis septus; child in first face presentation, chin posterior, because the pressure of the pains forces the foetal axis obliquely against the opposite pelvic wall. Text §§ 12, 39, 41. *C*, *C*<sup>1</sup>, two uterine horns; *C.R.*, contraction ring.

FIG. 100.—Arcuate uterus; oblique presentation with presenting shoulder. The cavity of the fundus is clearly marked, but not palpable. Text §§ 12, 41, 42. Lettering as in Fig. 99.

FIG. 101.—Pendulous abdomen, third degree; sagittal section, showing the position of the child and of the cervix; the fundus is lower than the latter. Text §§ 6, 12, 23, 33.

Original drawings.

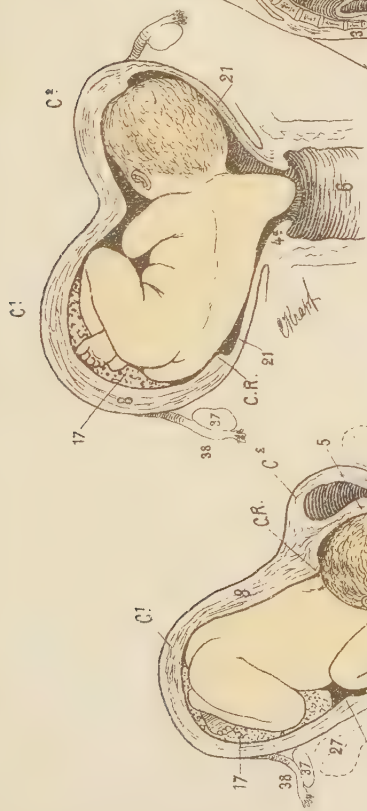


Fig. 99.

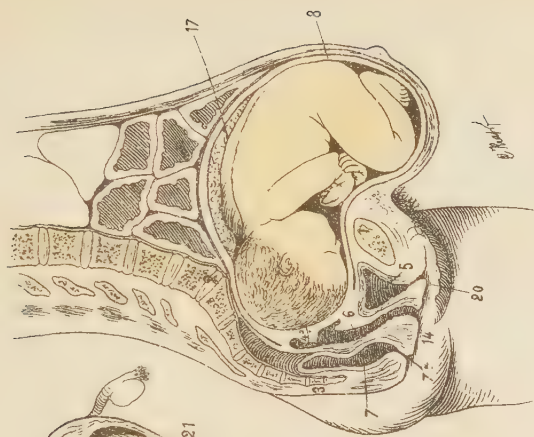


Fig. 100.

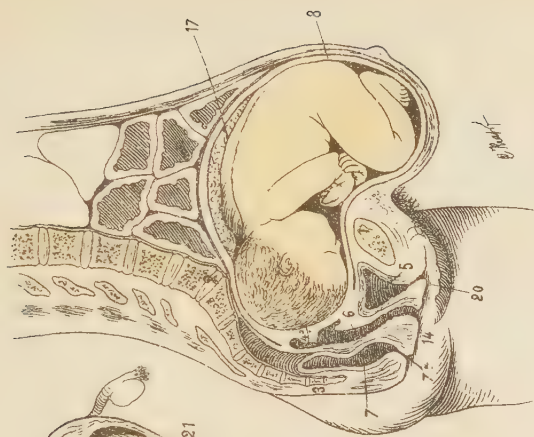


Fig. 101.





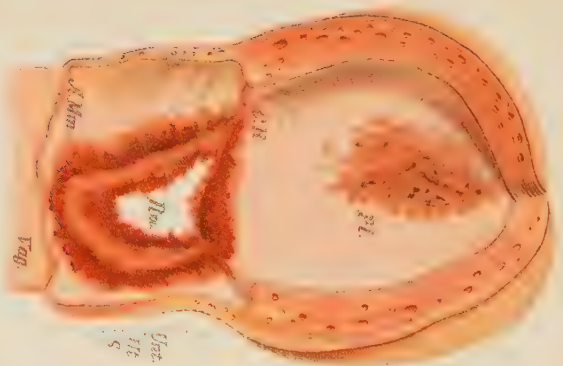


Fig. 102.

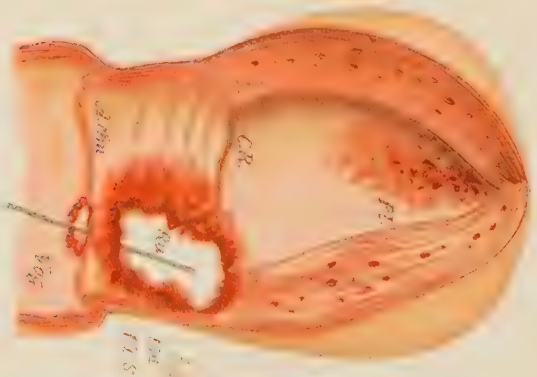


Fig. 103.



Fig. 104.



FIG. 102.—Funnel-shaped complete rupture of the uterus (*Ru*), extending from the contraction ring (*C.R*) to a thumb's width above the external os (*A.Mm*); the latter limit corresponding to the posterior peritoneal attachment or to the insertion of the retractores uteri muscles (comp. Figs. 28, 31). *Unt.Ut.S*, lower uterine segment; *Pl*, placental site.

FIG. 103.—This uterine rupture occurred like the preceding in the distended lower uterine segment, but then continued below the intact lip of the os directly into the posterior vaginal fornix. Lettering as in Fig. 102.

FIG. 104.—This rupture is analogous to the preceding, but with the lip of the os severed. The last two forms of rupture are especially dangerous because the infectious germs of the vagina penetrate directly into the peritoneal cavity. Text §§ 8, 42. Lettering as in Fig. 102.

Original drawings after preparations at the Munich Gynecological Clinic.  
Text §§ 8, 42.

FIG. 105.—Funnel-shaped rupture of the uterus due to friction necrosis at the promontory, seen from Douglas' pouch. To the right above is a small subperitoneal myoma (*My*) cut open. After von Winckel. Text § 42. *Fund.ut*, fundus uteri. Lettering as in Fig. 102.

FIG. 106.—Transverse rupture of the uterus (*Ku*)—preparation in sagittal section—resulting from thinning of the wall by epithelioma (*Ulc*) of the cervix. Text §§ 38, 42. Lettering as in Fig. 102.

Original drawings after preparations at the Munich Gynecological Clinic.

*Fund ut*



Fig 105.

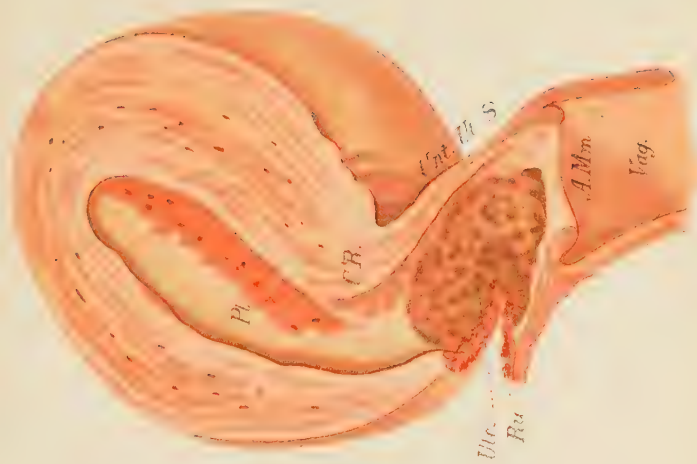


Fig. 106







Fig. 107

FIG. 107.—Rare rupture of the fundus (*Fund. ut*) with total escape of the foetus (*Fœt*) into the abdominal cavity. (*Da*, intestine.) Besides there is a laceration (*R*) near the cervix. Text §§ 37, 42. Lettering as in Fig. 102.

Original drawing after a preparation at the Munich Gynecological Clinic.

FIG. 108.—Right tubal pregnancy; sinistro-position of the uterus; true corpus luteum in left ovary. Transmigration of the ovum. Text § 44.

FIG. 109.—Ruptured gravid tubal sac; child in Douglas' pouch; adhesive peritonitis, as a result of which there is flexion of the right tube. Dextro-position of the uterus. Text § 44.

Original drawings after preparations at the Munich Gynecological Clinic.



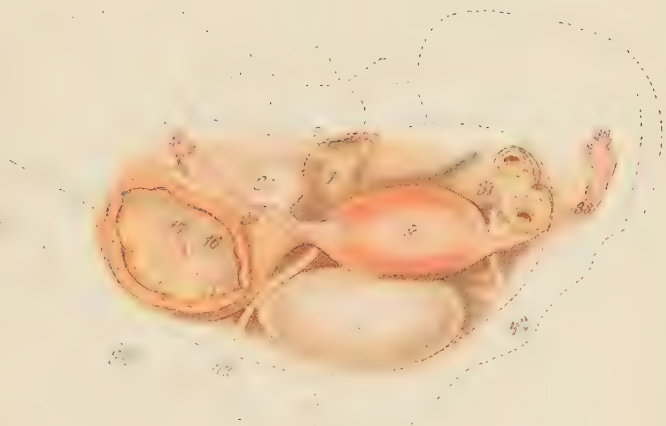


Fig. 108

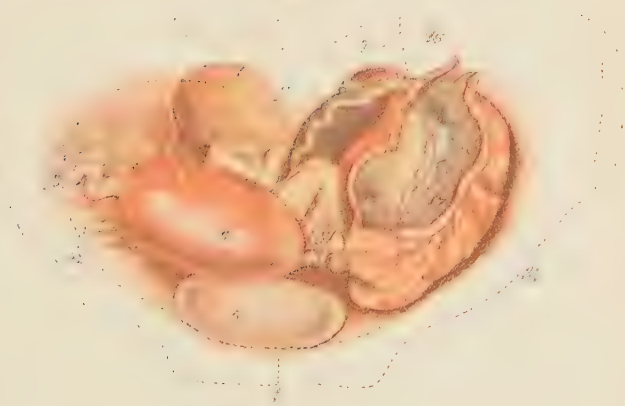


Fig. 109





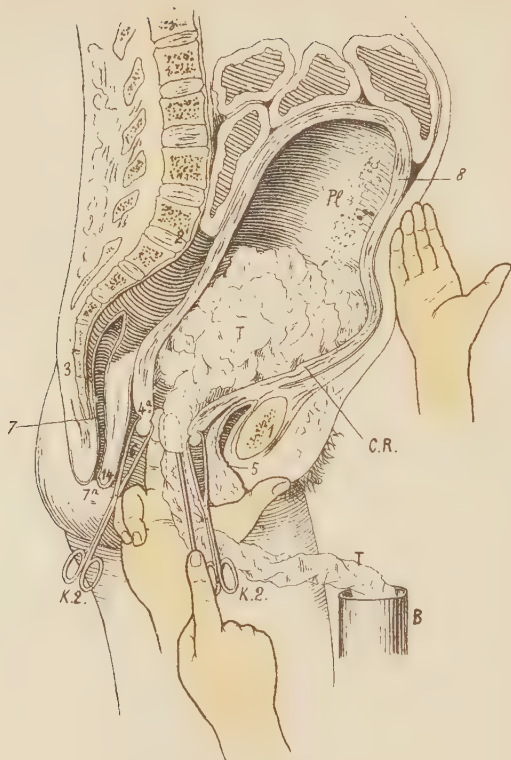


Fig. 110.

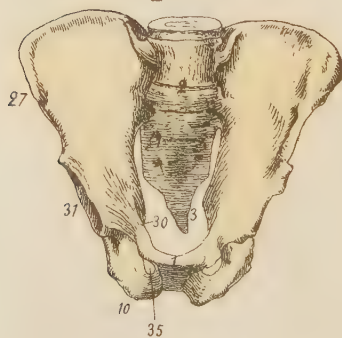


Fig. 111.

FIG. 110.—Tamponade of the bleeding uterus. After Dührssen. The lips of the os (4*a*) are drawn down with bullet forceps (*K.2*); sometimes the tamponade may be performed through the speculum. Introduction of the strip of ten-per-cent iodoform gauze (four-ply, hand wide, 5 yards long) directly from the tin box (*B*) into the uterus by means of a pair of dressing-forceps. The same hand upon whose second and third fingers the introduction into the cervix is made may exert pressure from without upon the fundus uteri (8) and still keep the second and third fingers aseptic for further use, as shown in the figure. Original drawing after Dührssen's direction. Text §§ 44, 47, 48, 55, 59. *C.R.*, Ring of contraction; *Pl*, placental site.

FIG. 111.—Robert's transversely contracted pelvis. Copy. Text § 27.

FIG. 112.—Interstitial extra-uterine pregnancy.  
Text § 44.

FIG. 113.—Abdominal pregnancy. Adhesive peritonitis. Text § 45.

Figs. 112 and 113 original drawings after preparations at the Munich Gynecological Clinic.



Fig. 113



Fig. 112









Fig. 115.

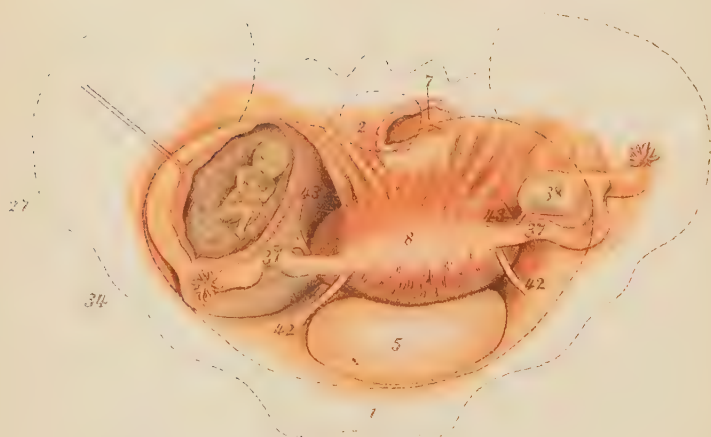


Fig. 114.

FIG. 114.—Ovarian pregnancy. Adhesive peritonitis. Left tube flexed. Text § 46.

FIG. 115.—Perforation of the bladder and rectum by the loosened bones of the absorbed foetus in a tubal sac. Uterus anteverted. Text §§ 44, 45.

Figs. 114 and 115 original drawings after preparations at the Munich Gynecological Clinic.

FIG. 116.—Profile view of the skull of a full-term child. After an original photograph. Text §§ 5, 12, 60. *o.mj* and *o'mj*, occipito-mental diameter; *G.L.*, the largest periphery of the skull which passes through in face presentations (the anterior end submentally is the larynx); *o.mi-s.o.br.*, suboccipito-bregmatic diameter; *H.L.*, the greatest periphery of the skull which passes through in occipital presentation, not quite corresponding to the suboccipito-bregmatic; *V.St*<sup>1</sup> and *V.St*<sup>2</sup>, the two largest peripheries of the skull which pass through in anterior parietal presentation according to the mechanism.

FIG. 117.—The same seen from above. After an original photograph. Text § 5. *tr.mj*, biparietal diameter; *tr.mi*, bitemporal diameter.

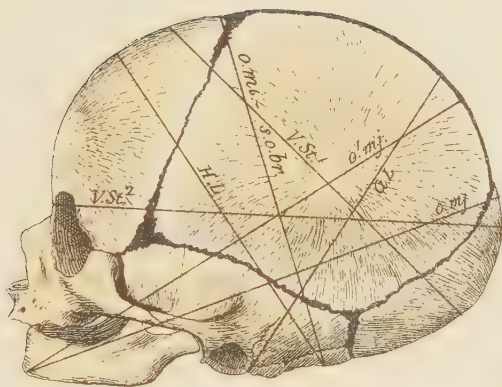


Fig. 116.

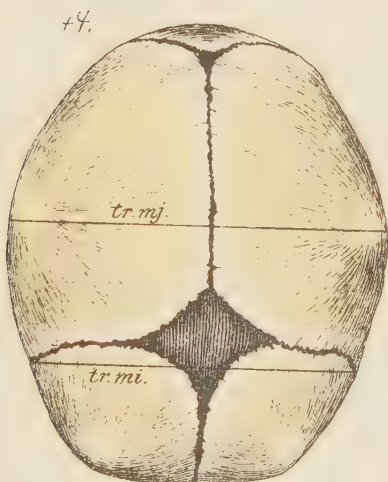


Fig. 117.





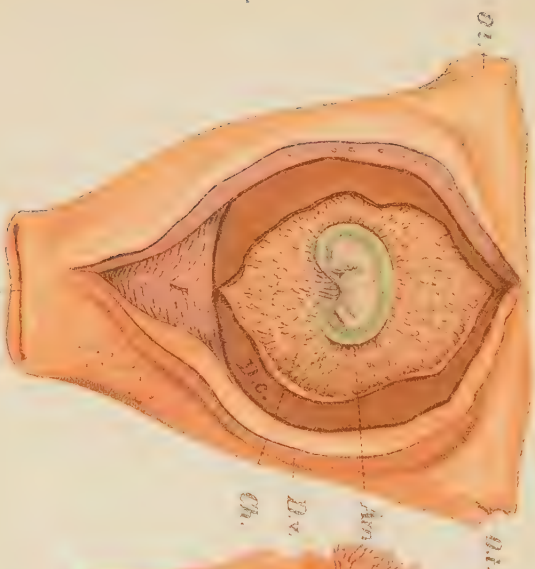


Fig 118

*M.*



Fig 119

*Dc.*

*Am.*

*Ch.*

*Nab.*



FIG. 118.—Complete ovum of the second month. Text §§ 7, 10, 48. Original drawing after a preparation at the Munich Gynecological Clinic. Through the opening cut in the decidua vera (*D.v*)—which reproduces the shape of the uterus in its triangular form and the corresponding three openings, the os (*J.M*) and the two tubal ostia (*o.t*)—we see the decidua circumflexa (*D.c*), the complete villous chorion (*ch*), and in the amnion (*am*) the embryo (cerebral vesicles, branchial arches, four extremities, very prominent cardiac and hepatic regions, and the caudal extremity).

FIG. 119.—Ovum of the third month. Original drawing. Text §§ 7, 48. We see the decidua circumflexa (*D.c*) and chorion (*Ch*) opened, the amniotic sac closed. The foetus depends from the translucent funis (*Nal*). The size of the head is still out of proportion to that of the trunk.

FIG. 120.—Microscopic appearance of a placental infarction. Original drawing after a personal preparation. Text §§ 48 and 49. 1, Cone of decidual cells in the chorionic placenta; 2, a broad, connective-tissue adherent villus in the decidual tissue supporting foetal vessels; 3, normal villi in the space filled with maternal serum and containing foetal vessels; 4, decidual cells forced apart by exudation and undergoing necrosis; 5, completely necrotic chorionic villi lying in the decidual cell cones changed into layers of fibres (6, forced into layers by the changing pressure of the uterus upon the ovum); 7, degenerated chorionic villi showing still a trace of nuclear staining in the spindle-cell nuclei, but coalesced into homogeneous masses which have resulted from necrotic cuboidal epithelium mingled with intervillous thromboses which have undergone secondary coagulation; 8, organization of these necrotic stratified masses; 9, thus giving rise to a broad band of connective tissue with numerous cells; 10, fibrinous intervillous thrombosis; 11, intervillous thrombosis before coagulation; 12, villus in the first stage of necrobiosis—homogeneous staining of the bordering cuboidal epithelium, the connective-tissue stroma of the villus is intact; 13, villus in the second stage of the degeneration—the border changes into a homogeneous stratified mass, staining slightly, which coalesces with the equally altered neighboring villus; the vascular walls are thickened at the points where the villous stroma is beginning to degenerate; 14, deposits of lime; 15, formation of small cysts within aciniform proliferations of cuboidal epithelium (16); 17, deposits of lime within such cysts.



Fig. 120.







Fig. 121.

FIG. 121.—Decidual endometritis. Original drawing. Text §§ 10, 49. 1, Dilated gland spaces with partly desquamated cylindrical epithelium; when there is great hypersecretion they evacuate their contents (as indicated in the figure between 9 and 10) between decidua circumflexa and vera into the free lumen of the uterus = hydrorrhœa gravidarum; 2, chorionic villi in partly degenerated decidual tissue (3); 4, intact chorionic vascular villi partly adjoining, partly adhering to the decidua vera in the free intervillous space (filled with maternal serum); 5, vascular villi branching from a penetrating villus (6), the latter merging into the decidual tissue; 7, capillary vessels greatly dilated in the interstitially inflamed portion (3 and 9), not so much in consequence of the inflammation as of the pregnancy; 8, glandular endometritis; 9, interstitial endometritis with accumulations of round cells and leucocytes; 10, decidua circumflexa merging into the vera; 11, gland invested with intact cylindrical epithelium, being in the uterine cavity not occupied by the ovum but belonging to the decidua vera; 12, decidual proliferations, forming sometimes polypous, sometimes bridge-like excrescences and possessing a telangiectatic character (7).

FIG. 122.—Ovum of the sixth month; placenta serotina, chorion, amnion opened. Fœtus one-third natural size. Modified from Haeckel. Text §§ 7, 48. *Am*, amnion; *Ch*, chorion; *Pl*, placenta.





Fig. 122.





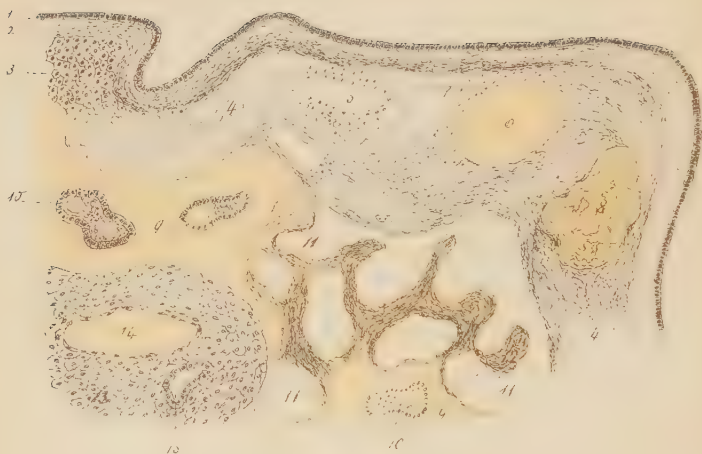


Fig 123.

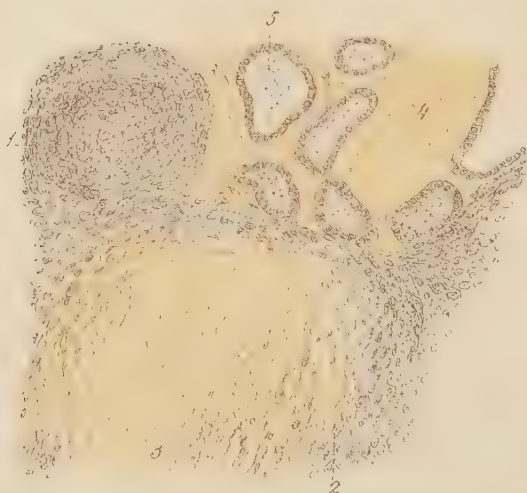


Fig. 124.

FIG. 123.—Subamniotic so-called “fibrin,” with cysts and extravasations. Original drawing after a personal microscopic preparation. Text § 49. 1, Single-layered cuboidal epithelium of the amnion; 2, the connective tissue belonging to it; 3, so-called chorionic cells, partly degenerated under exudation and changed by the pressure of the liquor amnii and uterus into fibrinous masses with parallel fibres (4); 5, homogeneous masses (completely necrotic villi?); 6, serum cyst without covering cell wall, like 8, blood cyst situated in the degenerated cell masses; 7, accumulations of round cells; 9, intervillous thrombi, coagulated in the neighborhood of the necrotic villi (11) which have coalesced by the necrotic strata of their cuboidal epithelium; 10, normal vascular villi; 13, decidual cone with large capillary blood space (14) and gland (15).

FIG. 124.—Subchorionic, *i.e.*, decidual apoplexy. Original drawing after a personal microscopic preparation. Text § 48. 1, Cone of decidua vera; 2, effusion of blood into the decidual cellular tissue, the fibres of the stroma being crowded apart at 3; 4, fibrinous thrombosis of the intervillous space with the normal chorionic villi here adjoining the decidua vera (5).

BOSTON MEDICAL  
OCT 7 - 1927  
LIBRARY

FIG. 125.—Intact amniotic sac (*Am*) torn loose by premature labor, seven months' foetus; at the top is a small piece of detached chorion (*Ch*); at the left the funis (*Nab*) is torn from its placental insertion. Text § 48.

FIG. 126.—Triangular piece of decidua vera expelled in extra-uterine pregnancy; external surface rough, internal surface showing gland openings and folds resembling a quilt. Text §§ 44, 48.

FIG. 127.—A similar specimen distinguished by the fact that exceptionally the decidua vera has also formed below the internal os in the cervix. Text §§ 44, 48.

FIG. 128.—Commencing abortion with subchorionic decidual apoplexies (*Ch.Häm*), some of which are partly perceptible through the amniotic sac (*Am*), some partly cut into. The most voluminous apoplexy in the decidua vera (*R.Häm*) represents the retroplacental hæmatoma arising from the separation of the chorion. The funis (*Nab*) is twisted. The decidua vera (*D.v*) extends to the internal os. Text § 48. *C.B.*, contraction ring.

Figs. 125-128 original drawings after preparations at the Munich Gynecological Clinic.



Fig. 128.

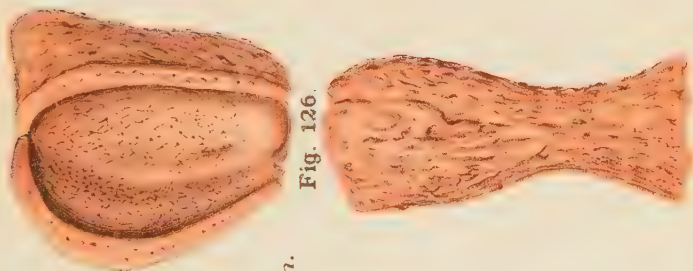


Fig. 126.

Fig. 127.



Fig. 125.









Fig. 129.



Fig. 130.

FIG. 129.—Vesicular mole (myxoma chorii multiplex) and hydramnion; hydatids of the funis. A portion of the placenta is still intact. Original drawing after a preparation at the Munich Gynecological Clinic. Text §§ 33, 49. *Pl*, placenta; *Am*, amnion; *Mo*, vesicular mole; *H*, hydatids; *Nab*, funis.

FIG. 130.—Case of twin labor with unilateral vesicular mole (*Mo*) which became malignant post partum, *i.e.*, penetrated into the muscular tissue (8); of the second placenta chorionic masses had remained behind and formed a placental polypus (*Pl.P*). The uterine cavity is filled with blood. Original drawing with considerable modifications based upon a case reported by Kaltenbach. Text §§ 48, 49. *Muc*, mucosa.

FIG. 131.—Villi in syphilitic inflammation; the connective tissue greatly proliferated (5) and—especially in the region of the vessels with thickened walls—infiltrated with round cells (5). Some villi have lost their epithelium (4) and are changing into intervillous fibrinous thrombi (3). Original drawing after a personal microscopic preparation. Text § 49. 6, Chorionic epithelium; 7, healthy blood-vessels of the villi.

FIG. 132.—Cross section through a syphilitic funis with inflammation of media and adventitia; round-cell infiltration of these coats and within this focus a central softening (3). The other thick-walled artery (2) shows the very characteristic triangular star shape of the intima, the thick elastic fibres of the media, and the broad adventitia. The vein (1) gapes widely with its thin walls. The stroma is formed by myxoid connective tissue (4). Externally the funis is invested with amnion, *i.e.*, a layer of cuboidal cells (5). Text § 49. Original microscopic drawing.

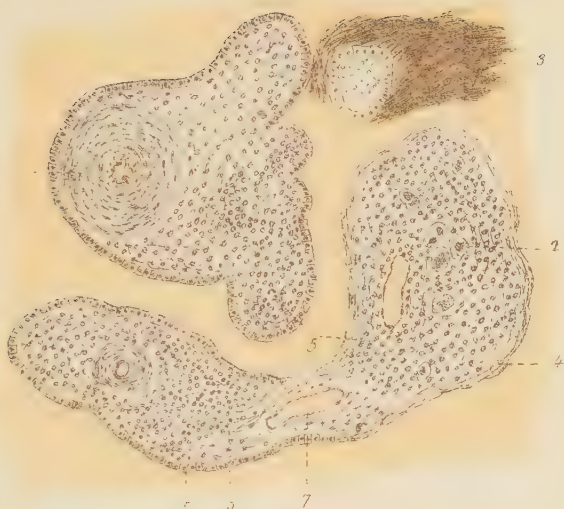


Fig. 131.

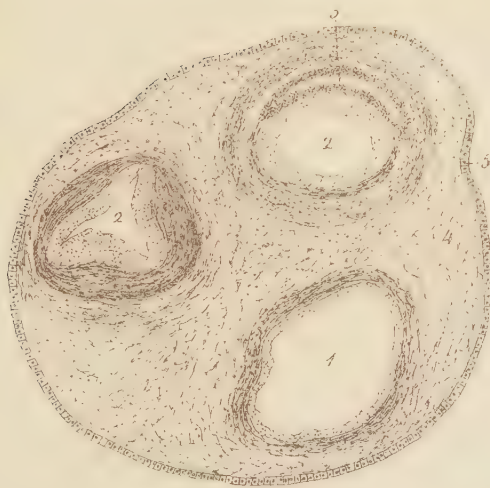


Fig. 132.





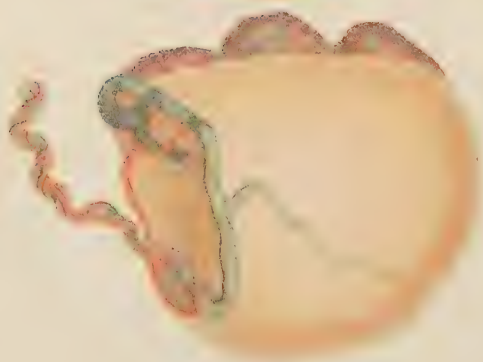
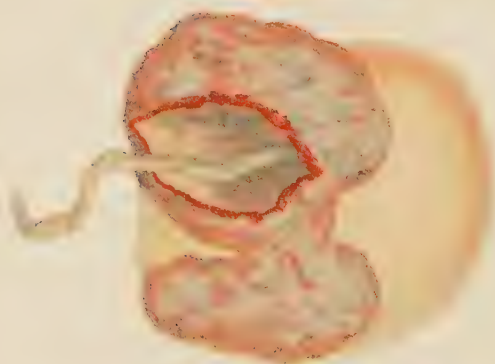




FIG. 133.—Placenta previa marginalis. Text § 47.

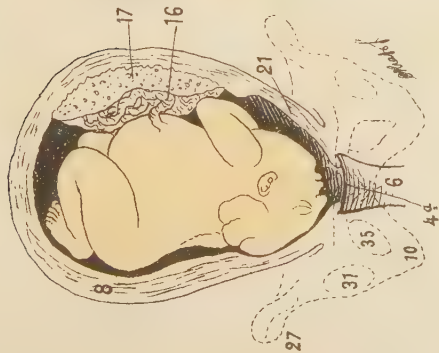
FIG. 134.—Placenta previa centralis and succenturiata; escape of the child through the placenta. Text § 42.

FIG. 135.—Placenta previa marginalis with velamentous insertion of the umbilical cord; the child passed through the large vessels in the membranes. Text §§ 47, 52.

Figs. 133-135 original drawings after preparations at the Munich Gynecological Clinic.

FIG. 136.—Engagement of an anencephalous monster in so-called face presentation.  
FIG. 137.—Dicephalus dibrachius engaged for delivery.  
FIG. 138.—Thoracopagus engaged for delivery.

Figs. 136-138 copied from Küstner. Text § 50.







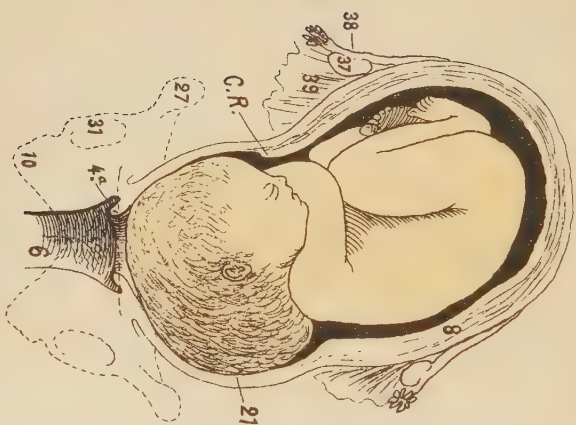


Fig. 139.

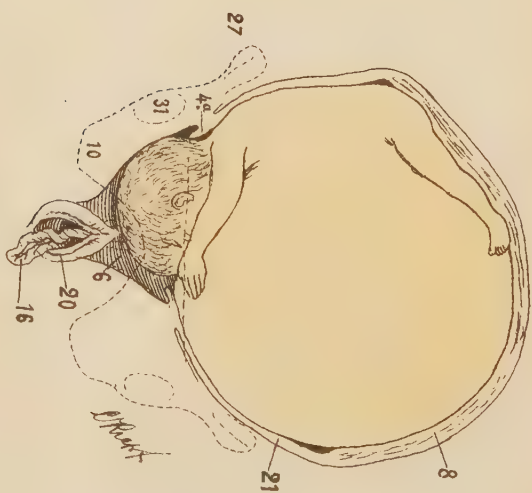


Fig. 140.

FIG. 139.—Hydrocephalus engaged for delivery. Modified from Bandl. Text §§ 42, 50. *C.R.*, contraction ring.

FIG. 140.—Atresia of the urethra has caused distention of the bladder and ureters with secondary hydronephrosis, combined with ascites; prolapse of the funis. After von Hecker, modified. Text §§ 5, 52, 53, 60.

FIG. 141.—Twin placenta; one full-term child living, the other killed by twisting of the funis (the torsions are closest at the umbilicus); this foetus has a very small nutrient area on the placenta. The other funis shows elongated arteries with circumscribed accumulations of jelly. Text §§ 48, 49, 50, 52. Original drawing after a preparation at the Munich Gynecological Clinic.

FIG. 142.—Placental infarction in eclampsia. Original drawing after a preparation at the Munich Gynecological Clinic. Text §§ 47, 48, 49.





Fig. 141.



Fig. 142.



## PART I.

### The Normal Anatomy of the Sexual Organs During Pregnancy.

#### CHAPTER I.

##### THE NORMAL FEMALE PELVIS AND ITS DEVELOPMENT.

During the latter part of gestation the genital tract is partly within and partly above the pelvis. The characteristic form of the female pelvis has been acquired through maintenance of the erect posture and the exercise of the generative function. The male pelvis inherits only those qualities which are due to the erect position. In the female pelvis all the bones are lighter in structure, and its whole cavity is more roomy, the transverse diameters in particular being greater.

##### § 1. THE DIAGNOSIS OF THE NORMAL FEMALE PELVIS.

(Figs. 1, 4, 5, 6, 7, 11, 25, 32.)

The symmetrical form is recognized by inspection and palpation; the woman must stand erect or rest horizontally. We determine that the spinal column has no kyphosis, no posterior curvature, and no scoliosis. The whole appearance of the woman, whether rachitic or dwarfed, must be observed. The pelvis is contracted if it is possible to span the distance be-

tween the anterior superior spines of the ilia with the extended thumb and little finger.

We measure externally with the Baudelocque-Martin pelvimeter (Fig. 4):

*The distance* between the anterior superior spines of the ilium on the living subject is 26, on the skeleton 24 cm. The points of the pelvimeter are placed on the side of the anterior superior iliac spines.

*The distance* between the iliac crests on the living subject is 28, on the skeleton 27 cm.

*Oblique diameters* on the living are 22.5, on the skeleton 21.5 cm. From the posterior superior spine to the anterior superior spine of the opposite side.

*Diameter of Baudelocque* on the living woman is 19.5, on the skeleton 18 cm. Distance between the spinous process of the last lumbar vertebra and the upper portion of the pubic symphysis.\*

*Antero-posterior diameter* of the outlet is, in life, 10-14, on the skeleton 11.5 cm. Measured in the Sims position, from the tip of the sacrum (or tip of the coccyx) to the lower end of the pubic symphysis.

*Transverse diameter* of the outlet is, on the living subject, 8-10.8, on the skeleton 8-9.2 cm. Measured in the lithotomy position, between the tubera ischii (inner surface), Fig. 5.

*Distance between the trochanters* in life is 31 cm. (§ 24). Limbs extended; pelvimeter is placed over the external surfaces of the trochanters.

\* To locate the spinous process of the last lumbar vertebra draw a line connecting the depressions corresponding to the posterior superior iliac spines. The second spinous process above this line is that of the last lumbar vertebra.

*Distance between the posterior superior spines* in life is 9.8 cm. (§ 22).

*Circumference of the pelvis* in life is 90 cm. (§ 22), measured over the symphysis, just below the iliac crests and across the middle of the sacrum.

All these measurements have only a relative value. The distance between the anterior superior spines must be less than that between the crests. (In the rachitic pelvis the distance between the crests is greater.)\*

*Distances between the crests*, 14–15 cm. (11.5–12.5 cm. in the rachitic pelvis).

*Oblique diameter*: less about 10 cm. (the right one somewhat larger)\* = oblique diameter of the inlet (12.5).

*The external conjugate*, 19–20 cm., less 8–9 cm. = true conjugate of inlet (11). We measure internally (Fig. 7, compare § 3). (16 cm. indicates surely a flat pelvis; 18 cm. in fifty per cent, a suspicion of a flat pelvis.)

*The diagonal conjugate*, † 12.5 cm. (Fig. 7) less 1.5 cm. (flat rachitic pelvis, 2–2.5) = true conjugate (11).

The exploring finger, passing from the promon-

\* The physiological pelvis deviates somewhat toward the left (left-sided scoliosis); therefore the right oblique diameter (also at the inlet) is larger than the left. The right side of the pelvis is flatter or the sacro-cotyloid distance somewhat shorter.

† The diagonal conjugate is the distance between the promontory of the sacrum and the lower border of the pubic symphysis. This diameter is not exactly in the plane of the inlet. If the pregnant woman is examined in the recumbent position (Fig. 25) and the promontory cannot be reached by the finger tip, the diagonal conjugate measures above 11.5 cm.; with the buttocks raised (Fig. 32) = 12½–13 cm.

tory toward the side, along the linea innominata, determines whether obstruction or asymmetry is present. The measurements of the inlet can also be determined by instrumental means (after Skutsch) (Figs. 6 and 11, compare § 5).

## § 2. THE FORM AND INCLINATION OF THE NORMAL FEMALE PELVIS.

(Figs. 1, 10, 12-15, 17, 25-27, 32-32b.)

The normal female pelvis is developed from that of the foetus by means of three factors (the weight of the trunk, the pressure of the femur, and the opposing resistance of the pubic symphysis), a result of growth.

1. The sacrum curves upon itself like the ante-flexed uterus (Figs. 12, 17); this makes the promontory project into the pelvis, while its central part is thrown backward; the alæ and the upper portion of the bone sink forward, while the pubic symphysis, instead of projecting, as in the foetus, recedes (Figs. 12 and 17).\*

\* This characteristic, wedge-shaped development of the lumbar vertebræ and of the sacrum (resulting in the promontory) is acquired phylogenetically through the erect position in walking. We therefore find even in the embryo a tendency to it, but the final transformation must be completed in each individual case. If one compares the relation of the femora to the longitudinal axis of the vertebral column in the foetus, newborn child, and adult, angles of  $130^{\circ}$ ,  $162^{\circ}$ ,  $195^{\circ}$  respectively are found, and thus the femur and pelvis recede. This transformation is produced by the erector spinæ muscle (Figs. 14 and 15). Fig. 15 shows a military over-extension of the pelvis.

2. This movement is almost compensated by another, in which that part of the pelvis situated anteriorly to the sciatic notch is lifted upward. The causes of this are partly the pressure of the femora (Figs. 1 and 13), partly a tendency to excessive development (inherited) of the horizontal rami of the pubes (especially the right); this stretches the pelvis transversely and the tightened sacro-iliac ligaments exert traction upon the crests of the iliac bones (Fig. 10).

3. A sinistro-scoliosis of the pelvis is caused by the right-sided hypertrophy of the horizontal ramus of the pubis and the corresponding part of the acetabulum, and of the ala of the sacrum and ilio-pectineal line of the left side. The symphysis is drawn toward the left.

The changes described under 1 and 2 terminate in the adult woman in a pelvic inclination\* of  $55^{\circ}$ – $60^{\circ}$  (in an unrestrained erect position with legs parallel; it varies between  $40^{\circ}$ – $100^{\circ}$  according to the position assumed, whether of military bearing or with the trunk inclined forward and legs flexed upon the body). This tendency to change renders the measurement, considered from an obstetrical point of view, worthless (it is of only limited anthropological interest); but the practical results obtained by change of position during obstetrical or gynecological operations

\* By pelvic inclination is meant the inclination of the plane of the inlet (conjugata vera) to the horizon, while the woman is standing; in this position the symphysis is at a lower plane than the promontory; the posterior diameter of the pelvis, from promontory to tip of coccyx, is 13 cm., the anterior wall (symphysis) 4 cm.

are of great value (Figs. 25-27, 32-32*b*). The recumbent position produces a relaxation of the muscles of the pelvis and thigh and an increase in the diameter of the genital tract (§ 5).

In the recumbent position, with the sacrum raised, the pelvic inclination is  $25^{\circ}$  (Fig. 25); with trunk elevated,  $20^{\circ}$  (Fig. 26); with the woman on the side,  $20^{\circ}$ ; in the lithotomy position,  $60^{\circ}$  (Fig. 32).

The greatest degree of inclination is obtained by placing the woman in the recumbent position, limbs hanging over the edge of the table unsupported, increasing the angle  $10^{\circ}$  (Fig. 32*a*); the knee-chest position (*à la vache*) increases it  $15^{\circ}$  (Fig. 32*b*).

### § 3. PRACTICAL CONCLUSIONS.

The engagement of the head which is arrested by the pubic symphysis, as shown by an internal examination demonstrating a diminution of the diagonal conjugate, can be facilitated by an increase of the pelvic inclination by placing a pillow under the hips (Fig. 32), thus causing retroversion of the spinal column, which tends to make the uterus sink backward and its longitudinal axis to become perpendicular to the inlet. The woman must press her back firmly against the supporting pillow; the thighs at the same time being strongly flexed. When the head is about to appear at the vulva, a lessening of the inclination will bring it nearer to the symphysis and decrease the liability to perineal laceration (Figs. 25 and 26).



## § 4. THE FULLY DEVELOPED NORMAL FEMALE PELVIS.

(Figs. 1, 12, 13, 17.)

The fully developed normal female pelvis shows, compared with the male pelvis, a greatly increased transverse diameter. It develops from that of the foetus through the formation of the promontory, increased transverse space, and disappearance of the funnel shape. A thorough knowledge of the foetal pelvis is important in order to better understand the pathological form.

*Foetal.**Adult Female.*

(Sex can be differentiated  
after fourth month.)

Transverse diameter  
small (from the third  
month).

Transverse diameter  
pronounced.

Conjugata vera: Trans-  
verse diameter = 100: . . . = 100: 122  
105-108.

Promontory very high;  
lumbo-sacral portion  
slightly convex.

Promontory projects  
forward and into the pel-  
vis; lumbo-sacral portion  
markedly convex.

Pelvic inclination  
= 75°-80°.

. . . = 55°-60°.

Sacrum and coccyx  
straight and almost ver-  
tical.

Sacrum and coccyx  
concave and vertical.\*

\* The most posterior portion of the bone gives attachment to the sacro-iliac ligaments and the erector spinæ; therefore the curved form of the sacrum is the result of their insertion, and of the weight of the trunk and its extension while walking erect. The

*Fœtal.*

Sacrum transversely flat; vertebral portion larger than the wings; cuboid in shape.

Sacrum relatively small.

Pubic arch =  $70^{\circ}$ – $90^{\circ}$

All the diameters of the true pelvis are relatively much smaller than in the adult female; funnel shape.

Iliac bones small, steep, shallow.

Inclination of the iliac bones at the linea iliopectinea =  $155^{\circ}$ .

Tubera ischii at the outlet nearer to each other than the spinæ ischii.

*Adult Female.*

Sacrum transversely concave; body and wings of equal size; wedge-shaped.

Sacrum relatively very wide.

. . . . . =  $90^{\circ}$ – $100^{\circ}$

All the diameters of the true pelvis increase markedly in comparison with the conjugata vera: the oblique and transverse diameters are especially increased.

Iliac bones wide, transversely expanded, concave.

. . . . . =  $125^{\circ}$

Between the spinæ ischii is the shortest diameter of the whole pelvis.

coccyx is pulled forward by the coccygeus muscles and levator ani, that is, toward their points of insertion, the ischial spines and the symphysis. The supra-spinous and sacro-sciatic ligaments act in the same manner. My investigations show that the upper portion of the sacrum and the posterior part of the sciatic notch deviate posteriorly about  $70^{\circ}$ —the anterior only  $40^{\circ}$ . Thus the anterior division of the true pelvis has a lesser dorsal inclination; this results in change 2 in § 2—the upward tilting and minor pelvic inclination in the adult. The symphysis executes a dorsal rotation of only  $50^{\circ}$  (whereas that of the sacrum is  $70^{\circ}$ ), resulting thus in an elevation of  $20^{\circ}$  (compare position of symphysis in movement 1, § 2).

## § 5. DIAMETERS AND MEASUREMENTS OF THE NORMAL FEMALE PELVIS.

(Figs. 1, 6, 11, 16, 18, 22-24, 33.)

### *Conjugata Vera.*

Inlet, 11 cm. (promontory to upper border of symphysis).

Cavity, 12.5 cm. (third sacral vertebra to middle of symphysis).

Sacro-pubic, 11.5 cm. (lower end of sacrum to inferior border of symphysis).

Outlet, 10-12 cm. (point of coccyx to inferior border of symphysis).

### *Transverse Diameters.*

Inlet, 13.5 cm. (greatest distance between the ilio-pectineal lines).

Cavity, 12 cm. (distance between the acetabula).

Bi-ischial, 10 cm. (distance between the spinæ ischii).

Outlet, 11 cm. (distance between the tubera ischii).

### *Oblique Diameters.*

Inlet, 12.5 cm. (sacro-iliac articulation to ilio-pectineal eminence of the opposite side).

Cavity, 13.5 cm. (sciatic foramen to obturator foramen of the opposite side).

Outlet (the borders are formed by ligaments which may stretch; therefore the diameter varies).

*The false pelvis* (Fig. 1) is formed by the iliac bones and the last two lumbar vertebræ (measurements and description §§ 1 and 4). It contains in-

testines and the pregnant uterus after the fourth month.

*The true pelvis* commences at the plane of the inlet; it is that part the pelvis below the ilio-pectineal line. The greatest diameter is the transverse; the head therefore enters the inlet with its maximum diameter, the sagittal suture, parallel to the transverse diameter. If the presenting part is not elliptical like the vertex, but round, as the face or breech, the longest diameter (displaced by the promontory) enters in the oblique. In rare cases the vertex enters in the oblique diameter = Solayre's obliquity.

The space of the inlet is diminished by the intestines, and psoas and iliacus muscles, but its dimensions remain the largest in the pelvis (from an obstetrical point of view) on account of their extensibility.

The plane of the cavity cuts the middle of the third sacral vertebra and the middle of the symphysis; the oblique diameter is its greatest. Therefore there occurs rotation of the head, which meets with resistance on the pelvic floor, into the oblique diameter (small fontanelle anterior) and simultaneously flexion of the chin upon the chest, caused by uterine contraction, the resistance offered by the borders of the pelvis, and the fact that the occipito-frontal diameter corresponds to a lever of unequal arms, the frontal being the longer. The oblique diameter is diminished by the pyriformis and obturator internus, but as its walls are elastic and only partly bony, it can be increased.

The widest plane is that parallel to the inlet and cutting the lower border of the symphysis. It represents a wide oval, slightly obstructed on the side by

the iliacus and psoas muscles. Resistance of its anterior border is diminished through the obturator membrane and muscles. It is at this point that the head, still inside the cervix, begins to rotate into the oblique diameter, if the os is dilated (5–8 cm.), while, if the membranes have ruptured, the presenting part pushes against the pelvic floor. The rotation under the pubic arch is favored by non-resistance in front and the resistance of the pelvic floor, which directs the head toward the outlet. The transverse diameters decrease from above downward, while the antero-posterior increase.

The plane between the apex of sacrum and the lower border of symphysis is important. Compared with that of the outlet: 1, Its conjugate is less elastic (11½ cm.) than that of the outlet (the mobility of the coccyx permits an increase of from 10 to 12 cm.); 2, this plane contains the shortest diameter of the whole pelvis, that between the ischial spines; 3, the head, if it has passed the inlet with the largest diameter and dilated the os from 5 to 8 cm., can be felt at this point. This is of great diagnostic value. The largest cranial diameter has passed the inlet.

The head now executes a decided anterior rotation under the pubes, owing to the pressure from above (contraction of the uterus and abdominal muscles) and to the resistance from the coccyx, perineum, and ischial spines below (Fig. 18). This rotation, accompanied by the involuntary action of the abdominal muscles and the distention of the perineum, is characteristic of the second stage of labor.

The pelvic outlet consists of two divergent planes: the posterior pelvic diaphragm (between coccyx and

ischial tuberosities) and the anterior one between os pubis and rima pudendæ. Obstructions in the outlet are met with only in the funnel-shaped pelvis and in anterior dislocation of the coccyx. The muscles situated between the lower border of the symphysis and the ischial tuberosities are of obstetric importance; they participate in the formation of the pelvic floor and in part constitute the sphincters of the rectum, urethra, and vagina (Fig. 33).

From the side of the coccyx (and ischial spine) arise the coccygeus and sphincter ani. The latter encircles the anus and vagina, and, strengthened by fibres of the transversus perinei, forms the constrictor vaginæ and is inserted into the symphysis pubis. The levator ani arises from the posterior surface of the body and descending ramus of the pubis, and the spine of the ischium, and crosses at a right angle the vagina, to which it gives a few fibres.\* Its insertions are the apex of the coccyx and side of the rectum.

The ischio-cavernosus is inserted into the clitoris. The superior and inferior transverse perineal muscles are placed one above the other and cover transversely the pelvic floor between the ischial tuberosities. These last-named muscles are therefore at a higher level, that is, nearer the pelvic cavity.

The descending head encounters the resistance of this group of muscles, and they exert an upward and forward pressure, which produces rotation (Fig.

\* The connection of the levatores ani with the vagina is not firm; it has no elevating power, but can produce a compressing force, which it exerts while the vulva is dilated by the descending head.

18). The head presses upon and stretches them, impelled by the force of the uterine and abdominal muscles downward and backward, until the line of junction between the frænum and the lower border of the symphysis forms a right angle with the conjugate of the outlet (in the non-pregnant state, a sharp angle). The first resistance which the head meets is the coccyx (Fig. 18); then it encounters the posterior part of the perineum, which is strongly distended and elongated. Thus the posterior fontanelle is pushed forward and under the symphysis, while the stretched levator ani and transversus perinei muscles open the anus widely and retract from the advancing head. The head now describes the third movement (around its transverse axis = extension), namely, rotation around the symphysis. The head responds to the pressure exerted. The expulsive force of the abdominal pressure is only slightly transmitted through the flexible vertebral column of the infant, but chiefly through the increased intra-abdominal pressure which acts upon its whole body. The vertebral column becomes an important transmitter of force, when it is in an inflexible condition (face or brow presentation).

The head describes in its descent through the outlet three movements, namely: 1. Flexion around a transverse axis, the chin approaching the chest; the small fontanelle gravitating lower—a result of expelling force transmitted through the vertebral column (§ 11).

2. Rotation around the occipito-mental diameter, the small fontanelle advances anteriorly, because the conjugate becomes wider toward the outlet.



3. Extension around the transverse axis; the neck resting against the symphysis and the occiput sweeping under the pubic arch—resistance of the pelvic floor. The anterior shoulder becomes fixed beneath the symphysis (the right one in L. O. A. position) as the occiput does and is born first, then the posterior or left shoulder is expelled. The occiput then turns toward the thigh of the mother which corresponds to the side of the pelvis which it originally occupied, *i.e.*, the left thigh in L. O. A. positions.

#### SUPPLEMENT TO § 5.

##### THE FŒTAL HEAD.

(Figs. 69-71, 116, 117.)

The right parietal bone is flattened (Stadtfeld). This is noticeable as early as the fifth month of intra-uterine life; in fact, the whole right side of the cranium is less developed and I have repeatedly demonstrated that the left hemisphere of the foetal skull is the larger. This fact may be connected with habitual use of the right hand. It is also interesting to note that this flattened right side adapts itself (in L. O. A. positions) to the physiologically smaller segment of the pelvic inlet. The frequency of this position corresponds, therefore, with the frequent left-sided enlargement of the pelvis. I have found that with the oblique diameters of equal length, the pelvis is usually small; while if the left segment is the larger, the pelvis is roomy.

The head in the passage through the pelvis adapts itself to the configuration of the birth canal by the



overlapping of the cranial bones; the transverse diameters are lessened, while the occipito-mental and occipito-frontal are increased. The presenting portion of the head is elongated and is the usual seat of the caput succedaneum and cephalhæmatoma.

The diameter of the skull of the fully developed infant is about six-tenths that of the maternal skull. Children of primiparæ have larger and firmer skulls; the diameters are increased about  $\frac{1}{2}$  cm.

*The full-term fœtal skull* presents about the following measurements (Figs. 116–117):

*Suboccipito-bregmatic circumference* = 32 cm. (in ordinary occiput positions).

*Fronto-occipital circumference* = 34 cm. (in right occipito-posterior positions).

*Mento-frontal circumference* = 32 cm.

*Submento-occipital circumference* =  $36\frac{3}{4}$  cm. (in face presentations).

*Diameter recta (fronto-occipital)* = 12 cm. (glabella to tip of occipital protuberance).

*Diameter transversa major (biparietal)* =  $9\frac{1}{4}$  cm. (between parietal eminences).

*Diameter transversa minor (bitemporal)* = 8 cm. (between lower extremities of the coronal suture).

*Diameter obliqua major (mento-occipital)* =  $13\frac{1}{2}$  cm. (from tip of chin to tip of occipital protuberance).

*Diameter obliqua minor (suboccipito-bregmatic)* =  $9\frac{1}{2}$  cm. (from the junction of neck and occiput to the bregma).

*Diameter verticalis* (from crown of head to base of skull) =  $9\frac{1}{2}$  cm.

## CHAPTER II.

## THE NORMAL GENITAL TRACT DURING PREGNANCY.

## § 6. THE DIAGNOSIS OF PREGNANCY.

(Figs. 92-94, 101, 19, 21, 29, 8, 9, 40.)

External examination comprises inspection, palpation, auscultation, and mensuration. Through these we determine:

1. Whether pregnancy exists.
2. Period of gestation.
3. Position of foetus.
4. Whether foetus is alive.

*Inspection.*—We note the increase of the abdomen and its configuration (normal or pendulous, Figs. 92-94, 101), the presence of old or new striæ gravidarum, the prominence or obliteration of the navel, the pigmentation of the linea alba, and the state of the breasts.

*Palpation.*—Four manipulations should be made use of, and in the following order:

*First manipulation* (Fig. 19) defines the position of the fundus (Fig. 29).

*Second manipulation* (Fig. 19) demonstrates the back and small parts (back to the left, head in the inlet = L. O. A.).

*Third manipulation* (Fig. 20) determines whether the head is engaged or like a hard ball may be moved hither and thither; also the approximate length of the child. (Head to breech = one-half length).

*Fourth manipulation* (Fig. 21) shows how deeply

the head has entered the small pelvis and whether the patient is a primipara or multipara.

*Auscultation* supplements palpation. We hear the pulsation of the uterine arteries, which causes a buzzing or humming sound, synchronous with the maternal pulse, the more rapid foetal heart sounds (120-150), at times accompanied by a humming sound, originating in the umbilical vessels. The hearing of the foetal heart sounds forms an absolute proof of the presence of a living child. In L. O. A. position the heart sounds are heard midway between the umbilicus and the left anterior superior spine.

*Internal examinations* should be as infrequent as possible, since, owing to the succulent condition of the mucous membranes, pregnant, parturient, and puerperal women can be very speedily infected by a single internal examination.

The internal examination determines, besides the anatomy of the true pelvis (*vide* §§ 1 and 5) the condition of the soft parts, whether the introitus or vagina is the seat of induration, constrictions, tumors, etc., the temperature of the vagina, the degree of dilatation and the direction of the cervix, also the attitude, presentation, and position of the foetus. The speculum is only exceptionally used, generally in the beginning of pregnancy. It shows the deep purplish color of the cervix, vaginal fornix, and nymphæ (Fig. 40).

### *The Diagnostic Signs of Pregnancy.*

These are the result of anatomical changes.

*a. Probable signs are due to the effects of pregnancy on the maternal organism:* Purplish color of

the nymphæ (Fig. 32),\* softening of the cervix, the external os is round, the fundus rises above the pubis, vaginal secretion is increased, a milky serum may be expressed from the nipples. Striæ gravidarum are caused by the rapid and great distention of the skin. The umbilicus gradually disappears as gestation progresses. Deposit of pigment in the linea alba; cessation of menses and uterine souffle.

*b. Positive signs belonging to the child:* The presence of foetal parts, movements of the child, foetal heart sounds (120–150), umbilical souffle.

*Primipara.*

*Multipara.*

*Vulva:* Gapes slightly.

Gapes markedly (scars).

*Vagina:* Narrow, rough.

Wide, smooth.

*Cervix:* Soft, conical

Soft, irregular shape.

(Fig. 40).

*External os:* Smooth, regular borders: remains closed until ninth month; if open, labor in a few days.

Borders are irregular: is open after the fifth month: admitting a finger, labor in two weeks.

*Internal os:* Firmly shut and remains so until obliteration of the cervix.

Open during the last weeks of pregnancy.

*Position of head:* In pelvic cavity.

Above the inlet, or has only slightly entered; fully movable.

To compute the length of gestation, take as starting-point the last day of menstruation, count three months backward, and add to the date thus reached seven days. Average duration, 265–280 days.

\* Already perceptible in the second month.

*Points of Differential Diagnosis.*

1. *Metritis, fibroid and ovarian tumors*: Menstruation continues; no uterine changes.

2. *Hæmatometra*: Menstruation has never existed; speculum and uterine sound show occlusion of os.

3. *Para- and perimetritis*: Fever is present.

4. *Retroflexion and retroversion*: Position and direction of the cervix are characteristic; cervix is hard.

5. *Retro-uterine hæmatocele*: Fluctuating tumor in Doulgas' cul-de-sac.

6. *Distention of bladder, fat in the abdominal walls, dead fœtus* (chilly sensation) must be taken into consideration.

## § 7. THE DIAGNOSIS AND ANATOMY OF THE DIFFERENT MONTHS OF PREGNANCY.

(Figs. 118, 119, 29, 40, 8, 122.)

*End of first month*: Uterus not appreciably enlarged; the soft, elastic consistence is also present during menstruation. *Ovum* =  $2\frac{1}{2}$  gm.; *length of embryo* = 0.8 cm.

*End of second month*: Uterus size of an apple; external os round; vagina and cervix purplish in color (Fig. 40). *Ovum* = the size of a hen's egg (Fig. 118); *length of fœtus* = 2.5 cm. (when the embryo is  $1\frac{1}{2}$  cm. in length it begins to resemble a human fœtus); the head is very large. Formation of placenta serotina (interception of gestation at this period = abortion). Mammæ secrete serum (gastric symptoms).\*

*End of third month*: Uterus size of foetal head;

\* The vomiting depends entirely upon pressure on the stomach; food should be taken in small quantities at frequent inter-

fundus at upper border of symphysis (Fig. 29); cervix recedes (Fig. 8); corpus develops disproportionately to cervix; lower segment soft; retro-uterine ligaments may be palpated with index finger in rectum, thumb in vagina. *Ovum* = size of a goose's egg (Fig. 119); length of foetus 9 cm., weight 20 gm.; head half the size of trunk; umbilical cord longer and twisted.

*End of fourth month:* Uterus size of an ostrich's egg; it can be palpated above the symphysis (Fig. 29); fills the true pelvis. Foetal parts may be felt; uterine souffle is heard. *Foetus:* Length = 10-17 cm., weight = 30-120 gm.; the sex is clearly defined. If prematurely born makes respiratory efforts.

*End of fifth month:* Fundus uteri midway between symphysis and umbilicus; its transverse diameter in right obliquity of pelvis. In multiparæ os admits one finger; striæ, pigmentation of linea alba, secondary areola. *Foetus:* Length = 20-25 cm., weight = 140-350 gm.; heart sounds audible; at from the eighteenth to the twentieth week foetal movements and vals; patient is not to rise in the morning until she has eaten something. Hyperemesis gravidarum is a grave complication; in the second stage vomiting occurs independent of alimentation; in the third stage the vomiting is mixed with blood and accompanied by fever and collapse.

This is to a great extent a neurosis, in fact dependent upon anatomical lesions, such as uterine displacement, erosions of the cervix, disorders of stomach and intestines, lesions of heart, kidney, liver, tubercular meningitis, and pernicious anæmia. The treatment is therefore directed against these special lesions or it is symptomatic. The duration of the disorders is rarely more than two or three months; the induction of abortion should therefore be done as a last resort. Narcotics and a fluid diet are indicated.

the head can be felt; later, the movements are visible.

*End of sixth month:* Fundus uteri (Fig. 29) 3-4 cm. below umbilicus; globular form becomes elongated, producing vertical position of foetus; softening of cervix extends to the middle; cervix at the level of the ischial spines appears shorter, due to hypertrophy of vaginal mucosa. Woman walks with body inclined backward. *Foetus:* Length = 26-34 cm., weight = 430-950 gm.; whines if prematurely born (Fig. 122) (partus immaturus).

*End of seventh month:* Fundus uteri (Fig. 29) 3-4 cm. above umbilicus; umbilicus flattened. *Foetus:* Length = 36-38 cm., weight = 820-1,150 gm.; cries with feeble voice; skin wrinkled, covered with hair. The pupillary membrane begins to disappear. A presenting part (showing that foetus is in vertical position) can usually be palpated through the vagina. Foetal parts are discernible.

*End of eighth month:* Uterus midway between umbilicus and pit of stomach. Mammary secretion pronounced. On account of the changed centre of gravity, woman inclines body backward. *Foetus:* Length = 40-43 cm., weight 1,300-1,600 gm.; child viable under favorable conditions; skin reddened; subcutaneous fat lacking.

*End of ninth month:* Uterus (Fig. 29) about 3 cm. below ensiform appendix. In multiparæ os internum open; in primiparæ os externum admits one finger toward the end of month. Abdomen reaches greatest degree of distention. *Foetus:* Length = 46-48 cm., weight 2,000-2,700 gm.; head slightly movable over pelvic inlet.



*Tenth month:*\* Position of fundus the same as at eighth month; sinks deeper into the pelvis about ten days before the beginning of labor: the result is that the upper edge of the uterine tumor is lower than before, due to relaxation of the soft parts and deeper entrance of the head into the pelvis (in primiparæ, into the cavity). *Fœtus:* Length = 48–50 cm., weight 3,000–3,600 gm.; liquor amnii = 1,500 gm. Weight of placenta about one-fifth that of fœtus = 400–1,000 gm. Cord = 50 cm.; uterine wall palpated through fornix of the vagina very thin (segmentum chartaceum), allowing the sutures and fontanelles to be easily distinguished.

## § 8. THE ANATOMY OF THE LOWER UTERINE SEGMENT.

(Figs. 17, 28, 30, 31, 52, 102–104, 127.)

The cervix does not participate in the development of the ovum; its mucosa is not changed into a decidua, but decidua cells may be found a few millimetres below the internal os. (A specimen of uterine mucous membrane, expelled during an extra-uterine pregnancy, shows that decidua cells may extend below the internal os) (Fig. 127).

The length of the cervix remains unaltered, the

\* The physiological duration of pregnancy is about two hundred and eighty days. Partus maturus (thirty-eighth to forty-first week); partus prematurus = twenty-eighth to thirty-eighth week; partus immaturus = sixteenth to twenty-eighth week (child not viable). Abortion = second to sixteenth week (placenta not developed). Beyond the forty-first week—three hundred days (and more) = partus serotinus, child excessively large. Missed labor is a term applied to a class of cases in which at the full period of pregnancy labor has commenced and subsequently passed off.



apparent shortening is simulated by vaginal hypertrophy (primipara) and resulting vaginal folds.

Müller's isthmus is a muscular ring like a sphincter, situated immediately below the internal os (Fig. 52). The ovum never extends beyond the internal os.

With the beginning of labor pains the uterus retracts toward the fundus, which tends to draw the lower segment up over the presenting part and simultaneously exerts an expelling force upon the child. Since the child represents the movable body, the propelling uterus must have fixed points to counteract the resistance met by the child in its descent through the pelvis. In cases of forcible uterine contraction (contracted pelvis, etc.), these points are found in the lower zone of the thinned uterine segment (Figs. 28, 31).

The uterus of a woman who has died sub partu shows two main divisions: the thick and contracted body and a thin segment extending to the inner os. The pregnant uterus presents, prior to the opening of the internal os, three divisions: the contracted body, the distended lower segment, and the unchanged cervical canal. During labor, the upper uterine segment, which is above the retraction ring, becomes thicker and is at the same time elongated, while the lower segment is thinned and transversely distended. Excessive and fruitless uterine contractions lead to an abnormal stretching and thinning of the cervical and vaginal portion; this shows a descent of the point of purchase (Figs. 28, 31).

The specimens of ruptured uteri in the Munich Maternity Hospital show mostly longitudinal and transverse tears beginning at the contraction ring and

extending to about  $\frac{1}{2}$ –2 cm. above the external os (Fig. 102). Sometimes the tear extends into the vagina (Fig. 104), but more frequently it is found that the laceration extends to within 1 cm. of the os externum, and, leaving this intact, continues into the vagina (Fig. 103). This proves that the uterus has three different points of purchase or fixed points: (a) Under normal conditions, at the os internum (retraction ring). (b) If the uterine contractions become exaggerated  $\frac{1}{2}$ –1 $\frac{1}{2}$  cm. above the external os. (c) In the upper segment of the vagina.

From this I conclude that the retracting uterine fibres, the retro-uterine folds of peritoneum (Figs. 28, 31), and the white, shining fibres (Fig. 34) of the broad ligaments, which after encircling the uterus at the level of the internal os pass into the sacro-, recto-, and vesico-uterine ligaments, form the point of purchase under normal conditions (a).

If the tissues between the fornix of the vagina and the cervix are excessively distended, the point of resistance is shifted to the fornix and overlying peritoneal fold (Fig. 28), and in case of uterine rupture, the tear will extend to that part of the cervix. The direction of the tear is dependent upon the position of the presenting part.

When the head is in the inlet the point of purchase is at the level of the internal os; and if the uterus ruptures while the head is in this position, the tear cannot extend beyond that point.

The so-called "lower uterine segment" exists after the first half of gestation. According to other authors (Hofmeier, Ruge, and Veit) it is not a result of pregnancy, as it can also be recognized in the non-

pregnant. This opinion is founded upon the position of the peritoneum and of the uterine vessels. I have also accepted the internal os as the lower line of demarcation of the lower uterine segment, not on account of the non-formation of the decidua in the cervix or the closure of the internal os during gestation, but because of the obstetrical point of fixation which is at this plane. The ring of retraction, however, is a variable structure nearly on a level with the vesico-peritoneal cul-de-sac (Figs. 28, 30, 31).

## § 9. THE CERVIX DURING PREGNANCY.

(Figs. 8, 9, 29.)

The position and direction of the cervix remain unchanged during the first few months of pregnancy (Fig. 29). After the fourth month the uterus extends above the symphysis and leans forward, thus throwing the cervix backward. Toward the end of pregnancy, concomitant with the rising of the uterus, the cervix is found on a level with the ischial spine; the external os rests upon the posterior fornix, near the promontory (Fig. 8), and, owing to the uterine dextro-position, the cervix points toward the left. About the fourth month the uterus rotates on its axis, the anterior surface turning to the right, thus making it possible to palpate the left round ligament.

The bladder is pushed upward and compressed; this may cause an obstruction of the ureters and hydronephrosis, necrosis of the renal epithelium, albuminuria and glycosuria (nephritis of pregnancy). The urine during pregnancy is increased in quantity and of low specific gravity; the excretion of urea is

not diminished. The kidneys, liver, and thyroid gland are hypertrophied, also the left ventricle of the heart, owing to its increased activity and the watery condition of the blood.

§ 10. THE ANATOMY OF THE UTERINE BODY, AND THE STRUCTURAL CHANGES OF ITS MUSCULAR COAT DURING PREGNANCY AND THE PUERPERIUM.

(Figs. 118, 35-37, 121, 43, 45.)

The uterus in the virgin is pear-shaped, 7-8 cm. in length, and its greatest transverse diameter is 3 cm. It weighs 30-40 grams.

The recently emptied and well-contracted uterus is ovoid in form, and 16-18 cm. in length; the thickness at the fundus is 2-4 cm. (making the vertical depth of its lumen as measured by the sound 15 cm.), and the weight is 750-1,000 gm.

The organ increases during gestation in weight, volume, and thickness, and this increase is mainly due to a development of its muscular fibres.

*The muscularis of the fundus* consists of circular and longitudinal fibres continuous with the muscular layers of the Fallopian tubes (Figs. 35, 36). These show clearly the formation of the uterus through the coalescence of the two Müllerian ducts. Aside from this no definite arrangement of its muscular fibres can be made out, so far as the formation of layers is concerned, but they run in every direction and interlacing form rings about the vessels (Fig. 43). The main fibres pass in longitudinal strands from the peritoneum toward the mucous membrane (Figs. 35, 37), cutting the walls of the uterus in oblique and

transverse directions (Figs. 36, 37). These main fibres are crossed and recrossed by a kind of mesh-work composed of large links (Ruge) (Fig. 37), whose fibres spring from the round ligament, ligament of the ovary and tube, sacro-, recto-, and vesico-uterine ligaments. This ill-defined mass of fibres (Fig. 43) is found in both non-pregnant and puerperal uteri and is the result of contraction.

The pregnant uterus presents a thinning of its walls (except during the first few months) and an increase in volume and capacity. This enlargement is due to an increase in length and number of the non-contracted muscular fibres, which now run in longitudinal and parallel strands. These fibres are pushed apart by loose and very succulent connective tissue, which changes the uterus from a hard, firm, and fibrous organ into a soft and flaccid mass, especially noticeable in the cervix. The uterus by its peripheral increase pushes the loose connective tissue toward the broad ligaments and grows into them. The fundus increases disproportionately in size, which changes the insertion of the tubes and ligaments to a correspondingly lower level.

During the puerperium the muscular fibres undergo a complete transformation by means of a granular degeneration (Fig. 45). Those near the mucosa form characteristic zigzag bands, and do not diminish to their former calibre. This is the reason why the uterus remains of large size after complete involution and does not return to the condition of the virgin uterus.

## § 11. THE ATTITUDE OF THE FŒTUS IN UTERO AND THE COMPRESSION FORCE OF THE UTERINE WALLS.

(Fig. 18.)

The foetus attains its attitude in utero from the tendency to accommodate itself to the ovoid shape of the uterus and the pressure of the walls of the uterine cavity, and not through gravity or inherent reflex movements. These same forces produce the uniform flexion and the relations of the foetal head to the pelvic diameters.

During contraction the uterus attempts to regain, so far as the contents permit, its original pyriform shape. The upper portion of the uterus contracts as a hollow muscle, and probably in consequence of the deficiency in muscular fibres, the lower segment assumes a cylindrical form. The cervix and external os are composed chiefly of circular and longitudinal fibres of the elastic variety; their dilatation is accomplished by the advancing head and the uterine contraction which shortens the longitudinal fibres and consequently exerts traction.

The contractions of the hollow muscle, combined with those of the abdominal muscles, exert a uniform pressure upon the foetus. The hollow muscle retracts about one finger's breadth. This dilates the lower uterine segment, and also produces an extension of the foetus, by force transmitted through its vertebral column.

The intra-uterine pressure may be measured by the introduction of a rubber bag into the cervix below the head (Schatz, Westermarck), the bag being attached



to a mercurial manometer. This pressure is the result of the contraction of the uterus, the intra-abdominal tension, and the gravity represented by the higher level of the fundus in relation to the pelvic inlet. The amount of gravity varies with the position assumed.

The intra-uterine pressure diminishes with the rupture of the membranes, to again increase; but, owing to the descent of the child and the escape of water, the former height is not reached. The intensity of the pains is dependent upon the degree of intra-uterine pressure.

The pains are at first separated by long intervals, which grow continuously shorter while the duration of the pains increases. The greatest frequency is attained at the end of the stage of dilatation and during the period of expulsion. Long, severe pains increase the intervals of repose, as the uterus requires a certain time for recuperation.

The uterine contractions pass in a peristaltic wave from the Fallopian tubes toward the internal os; according to Schatz's tokodynamometer their intensity varies between 8 and 27 kgm.

## § 12. NORMAL LABOR AND THE RELATIVE FREQUENCY OF THE DIFFERENT POSITIONS.

(Figs. 116, 96, 99, 100, 101.)

### *First Stage of Labor.*

Dilatation of the external os in primiparæ (multiparæ in the fifth month); the detachment of the lower foetal pole from the uterine walls; the head enters the lower segment of the uterus. The ring of Bandl re-

tracts above the pelvic inlet.\* The bag of waters ruptures when the external os has been dilated to 5 cm.† The head advances into the external os, now situated in the intra-spinal line.

*Duration:* Primipara = from twelve to twenty hours; multipara = from six to twelve hours.

### *Second Stage.*

After the membranes have ruptured, the head begins to rotate; vagina and vulva are distended; the head occupies the cervix. The pains are less intense, but the contraction of the abdominal muscles is added to the expulsive force (as a result of this the patient's face is congested and she perspires). Desire to defecate is caused by the contraction of the levatores ani and the pressure of the head upon the perineum.‡

\* The retraction of Bandl's ring to a hand's breadth above the symphysis or to the height of the umbilicus indicates an excessive thinning of the lower uterine segment and threatened rupture.

† Premature rupture of the membranes, before dilatation of the external os is complete, is undesirable, because if this occurs the hard head has to dilate the soft parts.

‡ When the head distends the perineum, the thumb and forefinger are placed along its sides, and by drawing the labia toward the orifice of the vulva produce relaxation; the other hand at the same time presses upon the advancing vertex and during the pains retards its progress until the posterior fontanelle is born. During the intervals between pains the perineum is pushed backward, or the delivery of the head may be hastened by pressing it well up under the pubic arch, after the Ritgen, Fehling, or Smellie-Ritgen methods.

When the tension is so great that the perineum looks pale and bloodless, lacerations are inevitable, and an incision as deep as



*Duration* : Primipara = from one and a half to seven and a half hours; multipara = from one-quarter to one and a half hours.

### *Third Stage.*

The contractions of the uterus detach the placenta in the manner described in § 49. The placenta then falls out of the cervix into the vagina, and the delivery if left to nature is accomplished through abdominal pressure.

*Duration*, from one-quarter to fourteen hours; average duration, from two to two and a half hours.\*

The placenta and membranes must be examined to make sure that they have been delivered entire.

necessary should be made on one side of the vulva through the fascia and into the constrictor vaginae.

After the birth of the head, the cord, if wound about the neck, must be loosened and slipped down over the head or shoulders.

The uterus, as it contracts, should be followed down through the abdominal walls. The birth of the trunk is aided by introducing the forefinger behind the posterior shoulder, which is lifted over the perineum. Next depress the head and deliver the anterior shoulder from under the symphysis. After bathing the child's face and eyes and placing a drop of two-per-cent solution of nitrate of silver in each eye, the cord is ligated in two places and cut between the ligatures. The first ligature is placed about 3 cm. from the navel and the second a few centimetres farther away. The second ligature retains the blood in the placenta, which is thus of larger size and causes more energetic contractions of uterus. In case of twins the second child is prevented from bleeding to death.

\* If the placenta is not spontaneously delivered it should be expressed by Credé's method. In adherent placenta, atonic condition of the uterus, or partial separation of the placenta with hemorrhage, the placenta must be removed by introducing the hand into the uterus.

*The Frequency of the different Presentations.*

Vertex presentations (anterior and posterior), . . . . .	93.0	per cent.
Face and brow presentations, . . . . .	0.8	"
Breech, . . . . .	4.6	"
Transverse, . . . . .	1.6	"

(*vide* § 52).

### § 13. THE UTERINE VESSELS AND THEIR CHANGES DURING GESTATION.

(Figs. 38, 41-43.)

*The uterine artery* passes from the anterior division of the internal iliac to the neck of the uterus, giving off branches to the vagina and vulva. Ascending in a tortuous course at the side of the uterus and between the layers of the broad ligament, it anastomoses near its termination with the ovarian artery, which, coming from the abdominal aorta, passes between the folds of the broad ligament and is distributed to the ovary and Fallopian tube.

*The veins* follow, as expanded plexuses, the course of the arteries. The pampiniform plexus passes along the Fallopian tube and empties into the renal vein and inferior vena cava (Fig. 41).

*The lymphatics* run partly from the uterine glands, partly from the subserous connective tissue, through the broad ligament to the hypogastric and lower lumbar glands of the pelvis, and farther on to the lumbar glands (Fig. 42).

During pregnancy the blood supply of all the genitals is greatly increased (Fig. 41), so that the liga-

ments of the pelvis are filled with serum. The uterine contraction diminishes the blood supply to the body of the uterus, but not to the inferior uterine segment and the cervix, and dilates the veins.

## § 14. THE NERVES OF THE UTERUS.

(Fig. 39.)

The uterine nerve supply is derived: (a) From the spinal cord by the third and fourth sacral nerves, which end in the lateral cervical ganglia. These nerve fibres produce the *dolores conquassantes*, or shaking pains, which are present during the latter part of the expulsive period. (b) From the hypogastric plexus leading to the uterine plexus situated upon the aorta. (c) In the anterior fornix of the vagina are Dembo's ganglia.

All these nerves contain motor and sensory fibres; those from the sacral nerves consist largely of centripetal inhibitory fibres. The ovarian nerves produce, upon centripetal stimulation, strong uterine contractions.

Uterine contractions are caused by a sudden loss of blood, increased vensity of the blood, high febrile temperature, ergot and other poisons, and direct uterine irritation. The last named acts in a reflex manner, but uterine contractions are also induced through primary uterine centres, which work without the aid of the central nervous system.

The nerves of the uterus are most irritable at the beginning and end of pregnancy; their connective-tissue elements are increased.

Conception and birth are possible after complete

destruction of the lumbar division of the spinal cord (experimentally demonstrated) in women; also with inaction of the brain and upper segment of cord; paraplegia, echinococcus, and neoplasm of the dorsal vertebræ. In such cases the nervous supply is probably from Dembo's centres.

The causes which determine the onset of labor are probably the following: Thrombosis of the placental veins and necrobiosis of the decidua; size of the child and consequent uterine distention; the influence of the menstrual period; excess of  $\text{CO}_2$  in the blood; opening of the internal os; the accumulation of tissue waste, and finally the increasing venosity of the blood in the head of the foetus, produced by the altered position of the orifice of the inferior vena cava, which empties almost completely into the right auricle.

## § 15. THE LIGAMENTS OF THE INTERNAL GENITALS AND THE PELVIC CONNECTIVE TISSUE.

(Figs. 28, 31, 46, 34, 30, 43, 38.)

The mesentery of the internal generative organs is represented during pregnancy by the broad ligaments. Owing to the increased blood supply they hypertrophy.

The peritoneum (Figs. 28, 46) also undergoes hypertrophic and hyperplastic changes from augmented cellular activity, as the possible stretching is not sufficient to accommodate the growing uterus. In front the peritoneum is reflected from the bladder upon the uterus at a point a little above the internal os, forming the anterior or vesico-uterine pouch (Figs. 28, 31). The underlying loose connective

tissue unites the uterus and bladder (Fig. 34). Behind, the peritoneum descends upon the rectum, and after covering a portion of the posterior vaginal wall passes on to the body and fundus of the uterus; the resulting pouch is termed the recto-uterine pouch or cul-de-sac of Douglas (Figs. 28, 43). From the sides of the uterus the peritoneum is reflected to the sides of the pelvis, forming the broad ligaments (Fig. 30). In the free upper border, between folds of peritoneum, is the Fallopian tube (Fig. 31); these peritoneal folds pass to the linea terminalis as the infundibulo-pelvic ligament. Situated upon the posterior surface are the ovary, not covered by peritoneum, and the parovarium. The vessels and nerves are between the anterior and posterior layers of the broad ligament, embedded in loose connective tissue (Figs. 43, 46, 30).

*The round ligaments* occupy a fold of the anterior layer of the broad ligaments, leaving the anterior part of the uterus below the Fallopian tube. They pass toward and through the inguinal canal, accompanied by an envelope of peritoneum (diverticulum of Nuck) and terminate in fibres which are inserted into the inguinal canal, spine of the pubis, and labia majora; some fibres are connected with the external and internal oblique muscles. The uterine end of the ligament contains muscular fibres, which increase during pregnancy so that the ligament attains the size of a finger. As the uterus rises out of the pelvis, the course of the ligaments is altered until finally they pass in a nearly vertical direction. Sub partu they are tense and, owing to the rotation of the uterus, the left one can be easily palpated.

*The vesico-uterine ligaments* are folds of peritoneum passing from the bladder to the uterus.

*The utero-sacral ligaments* consist of unstriped muscular fibres, which pass from the posterior surface of the uterus near the internal os to the anterior wall of the rectum. They are surrounded by peritoneum and thus form the sides of Douglas' cul-de-sac. The muscular fibres are termed the *retractores uteri* (Luschka), Fig. 31.

## § 16. THE OVARIES AND FALLOPIAN TUBES AND THEIR CHANGES DURING GESTATION.

(Figs. 44, 46, 47, 48, 50, 51.)

Each Fallopian tube is attached to the corresponding side and superior angle of the uterus and like the round ligaments its direction changes during pregnancy. The uterine end or isthmus is rich in muscular fibres, while the mucous coat, as compared with the fimbriated extremity or ampulla, is little developed (Fig. 44).

The mucous coat contains no glands. It consists of longitudinal folds lined with ciliated cylindrical epithelium. The ciliæ move toward the uterus and they thus produce a continuous current from the ampulla toward the isthmus in the serous fluid, which is normally present for purposes of lubrication. This current can conduct the impregnated ovum into the tube of the same or opposite side. When impregnated the ovum can also enter the uterus and again leave it by the opposite tube. The locomotion of the ovum after reaching the tube is due to the muscular action of the latter.



Transverse sections of the tube show that it is star-shaped (Figs. 44, 46). The mucous membrane is the seat of papilliform excrescences, some of which are present during the fifth month of foetal life. The ovarian end of the tube is surrounded by fringe-like processes (fimbriæ); a longer and more developed one of these is termed the fimbria ovarica. It accompanies the ligamentum infundibulo-ovaricum and is in intimate relation with the ovary. By its development the tube is forced to assume a downward curvature, beneath which the parovarium is situated. The fimbriæ develop during the third or fourth month of foetal life, at which time the ampulla is frequently still attached to the surface of the ovary, and if this persists may lead to tubo-ovarian pregnancy.

The muscularis of the tube (Figs. 44, 46) consists of a well-developed median layer of circular fibres. The external layer is thin and consists of longitudinal fibres.

The tube is surrounded by peritoneum on three sides. The fourth side, or hilus, is formed by intra-ligamentous connective tissue (Figs. 44, 46).

*The ovaries* which are about the size of an almond, are situated in a pocket of peritoneum (mesovarium) in the posterior layer of the broad ligament, and are connected with the uterus by the ovarian ligaments. Their surface is covered by a single layer of cylindrical epithelium, which is in marked contrast to the flattened endothelial cells of the peritoneum (Figs. 47, 48).

At about the third month of foetal life the surface germ epithelium proliferates luxuriantly, forming

Pflüger's cell tubules or cones, which, penetrating the dense fibrous stroma (albuginea), extend into the loose connective tissue of the cortex. Within this connective-tissue stroma the ova are developed, at first as large nucleated cells surrounded by cuboidal epithelium. These masses of germ cells and primordial ova become separated by the growth of the stroma, and the next step is the formation of the primary follicle in which the ovum is encircled by a single layer of flattened cells, the progenitors of the membrana granulosa (Figs. 47, 48).

Finally the mature Graafian follicles appear. The membrana granulosa is a layer, usually several cells deep, of the so-called follicular epithelium. At one side this follicular epithelium is heaped up into a larger mass which projects into the cavity of the follicle, forming an accumulation of cells called the discus proligerus; this contains the ovum. The remainder of the cavity is filled with a colorless fluid, the liquor folliculi.

The ovum consists of an external striated membrane, the zona pellucida. Within the zona pellucida is the vitellus, or yolk, enclosing the germinal vesicle, in which is found the nucleolus or germinal spot. As the Graafian follicles mature they approach the surface of the ovary and often project beyond it. They finally burst at a menstrual period, their rupture (Fig. 50) being followed by the formation of the corpus luteum verum (Fig. 51), the cells of the follicular epithelium proliferating and also undergoing fatty degeneration. These, with newly formed round cells, form a soft, yellowish mass, which, surrounding and enclosing the remains of the extravasated blood,



gradually shrinks to an irregular cicatrix, the corpus fibrosum or candidans.

*Rosenmüller's organ*, parovarium or epoöphoron, is composed of twelve or fifteen very fine tubes presenting an internal and external layer and lined by ciliated epithelium. The tubes end in a cul-de-sac pointing toward the hilum of the ovary. They are situated in the middle layer of the broad ligament, between ovary and tube, and represent the vestige of the Wolffian body. All these pass upward toward the tube and empty into a canal parallel to it. They sometimes form small serous cysts.

## § 17. VAGINA AND VULVA AND THEIR CHANGES DURING PREGNANCY.

(Compare §§ 16, 18-20.—Figs. 40, 33, 30, 31, 53-55.)

*The vulva* during pregnancy is more or less swollen and the seat of a venous congestion (Fig. 40). This results in the purplish color, which extends into the vagina and is most marked at the cervix.

The mucosa of the vagina shows, besides a hypertrophy of the papillæ, a general augmentation in size. It is roughened, the folds are more conspicuous, and its length is increased. The secretions are greatly increased.

*The vagina* extends from the external os to the margin of the hymen. This is the extent of surface which, as early as the sixth month of foetal life, is covered with stratified pavement epithelium. In the adult the cells of the uppermost layer are horny. The next layers consist of thickened pavement epithelium, and deeper yet are found easily attainable matrix

cells, which form the transition stage between cylindrical and cuboidal cells. The epithelium is arranged in squares into which numerous papillæ project. This epithelial formation is characteristic of cervix and vagina. Single cells are connected by delicate threads of protoplasm containing, besides a nucleus, large vacuoles. True glands are separated by a few glandulæ aberrantes, cervicales et vulvares; lymph follicles are regularly present in connection with a widely distributed lymphatic system.

The muscular coat is rich in veins, and consists of bundles of smooth muscle cells; separate layers cannot be distinguished. The muscularis produces no expulsive force, but only encloses, like the cervix and lower uterine segment, the advancing fœtus. Muscular fibres connect the cervix with the vagina (§ 8, lower uterine segment).

The submucous connective tissue contains abundant nervous and venous structures; its anterior and posterior walls each present a longitudinal mass of fibres, the vaginal columns. The anterior column is not directly opposite the posterior, but more toward the right side, a consequence of the displacement of the left duct of Müller. The numerous transverse rugæ, which make the enormous distention of the vagina during parturition possible, connect with the vertical columns. Posterior to the orifice of the urethra is found a prominence, the promontorium vaginæ. The smooth muscularis is encircled by rich fibro-elastic tissue, an extension of the pelvic muscles. The lower third of the vagina is surrounded by a thin plane of muscular fibres, constituting the constrictor vaginæ muscle. The posterior fornix forms the most de-

pendent part of the anterior wall of Douglas' pouch, and this is covered by peritoneum.

*The hymen* forms the junction between vulva and vagina. It originates from the entoderm and ectoderm, and thus is partly a vaginal, partly a vulvar structure. It begins to form in the fifth month of foetal life, out of two parallel folds, of which the external surrounds the meatus urinarius. The two small tubes next to the urethra were originally within this external fold. The other crypts which are seen represent the tubes of Skene.

*The urethra* opens into the vestibule, that is, the urogenital sinus, the anterior border of which is formed by the clitoris.

*The clitoris* resembles a rudimentary penis. It consists of the erectile corpus, which ends in the glans clitoridis. Continuous with the erectile corpus cavernosum are the crura which also consist of cavernous tissue and are attached to the ischio-pubic rami. The bulbi vestibuli are two elongated venous masses situated at the sides of the hymen and attached to the crura clitoridis.

*The nymphæ* and *frenulum* form the inferior and lateral margins of the vestibule. The former possess numerous papillæ covered by stratified pavement epithelium. In the labia majora these papillæ are absent. In the adult both the labia majora and nymphæ have numerous sebaceous glands (in the foetus only the labia majora). The stroma of the nymphæ is rich in nerves and blood-vessels (numerous Meissner's tactile bodies).

*The vulvo-vaginal glands*, or glands of Bartholin (Fig. 33), are of the racemose type. There are a right

and a left, situated in the postero-lateral portion of the vagina below the external surface of the hymen. With its excretory duct, which opens laterally to the lower third of the hymen, each is 3-4 cm. long. They are the only structures of the vulva covered by cylindrical epithelium. The perineum terminates at the fourchette or frænulum vulvæ and consists of the above-described muscles (§ 5) and a thin layer of fat (Fig. 33).

*The vaginal secretion* is normally of an acid reaction and contains pavement epithelium and bacilli. These bacilli produce lactic acid, which, when of a strength of one per cent, destroys pathogenic bacteria (cocci). With an increased secretion the bacilli become also more numerous, together with leucocytes, leptothrix, oidium albicans, and trichomonas vaginalis.

A primary gonorrhœa of the vagina is rare. The secretion is thick, purulent, or sanguineo-purulent, mostly the result of cervical gonorrhœa, the admixture of which makes the reaction of the vaginal secretion neutral or even alkaline. In this case the vagina becomes the nidus of fever-producing streptococci instead of the normal vaginal bacilli (Döderlein). During the puerperium the secretion (Figs. 53-55) varies according to the nature and number of bacteria present.

1. *Lochia cruenta or rubra* contains shreds of decidua and blood.

2. *Lochia serosa* contains less red blood corpuscles, more leucocytes and serum, also pavement and cylindrical epithelium, staphylo-, mono-, diplo-, and streptococci and bacilli, even in puerperæ who have no

fever, but the cervical canal is free from germs (Döderlein). Its reaction is alkaline. From the fourth to the seventh day it has the odor of stagnant pus.

3. *Lochia alba* contains mucus, numerous pus corpuscles, less epithelium, fat granules, and cholesterin, immature spindle cells in a state of fatty degeneration, and the above-named micro-organisms. Reaction neutral or acid. Becomes gradually lighter and translucent. The quantity is proportionate to the secretion of milk.

*In puerperal fever* the streptococci in the vaginal secretion are enormously increased; they also invade the uterus and are found in the peritoneal exudate and in the blood. Streptococci pyogenes and erysipelatosus are found, but it is now claimed that these are identical. Besides these, staphylococci and saprophytes are present.

## § 18. THE MAMMÆ AND THEIR CHANGES DURING PREGNANCY.

(Figs. 49, 56, 57; compare also §§ 6, 7, 17, 19, 20.)

A milky serum can be expressed from the nipples after the second month; pigmentation of the primary areola, striæ, and the secondary areola are the changes noted in the fifth month; the glands of Malpighi are hypertrophied. The milk glands are developed by the growth of the acini and interlobular connective tissue and the deposit of fat between the lobes. Each lobe represents a highly developed sebaceous gland, whose secretory portion is the group of acini. The excretory tube or lactiferous duct of each lobe leads to the nipple, where they form the lactiferous sinuses.

The epithelium of the glands consists of flat polyhedral cells, which have a granular appearance. These cells rest upon a delicate membrana propria, which, except an external layer of endothelial cells, alone separates the secreting cells from the lymph channels. During pregnancy the cells become higher, cuboidal, more granular and richer in protoplasm, and within the acini oil drops are formed, while the lining epithelium is disintegrated.

*Colostrum* consists of fat globules contained in the displaced alveolar epithelium, forming colostrum corpuscles. These are particularly abundant in the first days of the puerperium and do not completely disappear until the fifth or sixth day. Milk is formed by the breaking up of the colostrum corpuscles liberating the oil globules which intermingle with the milk serum (Figs. 56, 57).

The haptogenous membrane, the albuminoid membrane of the milk corpuscle, is only apparent. Milk is a simple emulsion, containing also leucocytes and single cells.

Human milk\* secreted to the amount of 500-1,500 c.c. per diem has a specific gravity of 1.026-1.036 and contains:

Casein,	.	.	.	.	.	.	.	3.92
Fat,	.	.	.	.	.	.	.	3.66
Milk sugar,	.	.	.	.	.	.	.	4.36
Salts,	.	.	.	.	.	.	.	0.14
Albumin,	.	.	.	.	.	.	.	0.38
Peptone,	.	.	.	.	.	.	.	0.13-0.33
Also urea, lecithin, and cholesterin.								

\* Colostrum consists mainly of albumin, which in milk changes into casein (coagulated upon boiling and precipitated by rennet), and of magnesium and calcium phosphates, and the



## § 19. THE CHANGES IN THE NON-SEXUAL ORGANS IN PREGNANCY AND THE PUERPERIUM.

(Compare §§ 9 and 20.)

*Pregnancy.*

*Bladder* displaced upward, compressed; desire to urinate; ureters and kidney-pelvis dilated; necrosis of renal epithelium; albumin and sugar in urine, which is increased and contains more water. Quantity of urea not altered (*kidney of pregnancy*).

*Kidney* also hypertrophied (§ 9).

*Liver and thyroid gland* hypertrophied.

*Heart*: Hypertrophy of the left ventricle. Increased pulse frequency. Slight difference between lying and standing posture, which is only possible after compensation has been established.

chlorides of sodium and potassium, which act as laxatives in evacuating meconium.

\* Causes: altered blood pressure, mental and physical repose, horizontal position, decreased abdominal pressure (stasis in the abdominal veins, less blood in heart and lungs, decrease of blood

*Puerperium.*

*Urine* decreased on the first and second days, then increased; contains milk sugar, acetone, nitrites proportionate to the milk secretion (most abundant on the third to fifth day). Peptonuria (a result of the disintegration of the uterine muscularis, absent after Porro operation).

*Pulse*\* immediately post partum 40–60, soft. Temperature, 37.2–38.2° C. (average, 37.46°, von Winckel).

*Pregnancy.*

*Blood* more watery, leucocytes increased, red blood corpuscles diminished (as a consequence of the hydræmia); hæmoglobin increased.

*Lungs* displaced; upward movement of the diaphragm; transverse dimension of thorax increased, longitudinal diminished. Vital capacity unchanged.

*Formation of osteophytes* between the skull and dura mater.

*Puerperium.*

Leucocytosis disappears; quantity of red blood corpuscles unaltered. Amount of hæmoglobin decreases in the first few days. About the seventh day (end of lochia serosa) red and white blood corpuscles become more numerous. Many small red blood corpuscles and small glittering bodies.

Vital capacity increases on the third day.

pressure). According to Fritsch respiration is slower and all functions of the body are diminished; retardation of pulse in consequence of inspiration (vital capacity of lungs increases on third to fifth day). Against the other theories (resorption of fat from the degenerated uterine muscularis, disturbances of innervation, diminished demand upon the heart, etc.) which are claimed to be the cause of decreased pulse rates, it may be argued that after abortion also the pulse becomes slower within three and a half-hours post partum.



*Pregnancy.**Puerperium.*

*Hypertrophy of the gums.*

*Hypersecretion of skin, chloasma, varicose veins.*

*Intestines:* Great constipation.

Constipation physiological up to third or fourth day (action of bowels increased by meat diet).

## § 20. THE PHYSIOLOGY OF THE PUERPERIUM.

(Compare §§ 16-19.)

The involution of the genitals extends over a period of six weeks. On the first day the fundus is on a level with the umbilicus; by the fifth day it is nearly midway between the umbilicus and the pubis, and on the tenth day slightly above the pelvic brim. The intermittent uterine contractions continue for a few days; in multiparæ they are at times exceedingly painful (after-pains).

Non-lactation retards involution. From the second to the fourth day the breasts begin to expand and are painful. At first they contain nothing but colostrum; this is followed by the secretion of true milk. Early application of the infant favors the flow of milk. The lochial discharge is more or less bloody for about four or five days, then it becomes lighter in color and of a serous quality and finally ceases.

The pulse during the first week is often below 60. The temperature may rise to  $99\frac{1}{2}^{\circ}$ .

The patient is liable to retention of urine owing to

lowered intra-abdominal pressure. Peptonuria is normal.

The diet for the first two days should be restricted to fluid or light solid food, after this and when the aperient (the best is castor oil) usually given on the third day has operated, a more liberal diet may be allowed.

The patient remains in bed for nine days; during the first three days in the recumbent posture, otherwise air may enter the uterus.

Menstruation returns in six to eight weeks post partum (if not nursing).

### § 20a. THE PHYSIOLOGY OF THE CHILD.

During the first few days the child's weight decreases; on the eighth day it has regained its weight at birth. Meconium is discharged for four days, then the stools become feculent. On the fourth day icterus (physiological) appears.

The child's temperature is  $98.6^{\circ}$ , the pulse about 130, respiration averages 45 per minute.

The umbilical cord (which should be kept dry and aseptic) shows a line of demarcation by the second day and about the fifth it falls off.

Within ten or twelve hours after birth the child should be put to the breast. Frequency of nursing, for two days every four hours, then every two hours. At night less frequently.

## PART II.

### **Pelvic Deformities and Their Influence upon Pregnancy and Labor.**

#### § 21. THE DIAGNOSIS AND THERAPY OF THE DE- FORMED PELVIS.

(Figs. 69-71.)

With regard to the diagnosis (compare §§ 1, 5) the consideration of the skeleton as a whole\* and the careful palpation of the pelvic cavity are the most important points. External as well as internal asymmetries are determined through sight and touch. In rickets the distance between the anterior superior iliac spines equals or exceeds that between the iliac crests; in the obliquely contracted pelvis one iliac crest is frequently higher than the other. The configuration and roominess of the pelvic entrance, the direction of the promontory, especially in regard to the plane of the inlet, the condition of the pubic joint (compare § 31, No. 12), the inclination of the symphysis (in rickets more vertical), and further whether the symphysis is opposite the promontory (oblique pelves), should be noted. One commences

\* A kyphosis in the lumbo-sacral region arouses a suspicion of funnel-shaped pelvis, and scoliosis and limping of oblique pelvis. Large joints and other bony deformities, pendulous abdomen, indicate probably a flattened pelvis.

by palpating the ischial tuberosities and spines and the width of the pubic arch (in funnel-shaped pelvis the former is contracted, while in rickets the latter is widened); also determine whether the coccyx is not dislocated anteriorly. Examine for exostoses on the points of predilection (§ 31); the history of previous confinements is also important.

Measurement of the pelvis may demonstrate a uniform diminution (pelvic circumference) or the shortening of single diameters, especially of true conjugate, oblique diameter, or the diameters of the outlet.

If the shortening of the true conjugate is the result of rickets, deduct from the diagonal conjugate 2–2.5 cm. instead of 1.5 cm. (on account of the more vertical position of the symphysis—compare § 1).

Contracted pelvis includes, from an obstetrical point of view, not only the contractions which obstruct labor, but also those which are the cause of abnormal presentations. Litzmann gives as the limit for the true conjugate 9.7–10 cm.

As a result of pelvic deformities the uterus has often an anomalous position and form. This alone may affect the descent of the child into the true pelvis. The duration of labor is prolonged; in fifty-six per cent the head enters the true pelvis only after complete dilatation of the cervix. This may produce premature rupture of the membranes (that is, before dilatation is complete). In the flattened pelvis there is much amniotic fluid in front of the head.

The pains are not feeble in the beginning of labor, but often become so from the continued high position of the head, the compression of the cervix, and premature rupture of the membrane (then the hard

head must dilate the os, producing swelling, contusions, lacerations, etc.), abnormal foetal positions and presentations, and cicatrices, the result of former deliveries. The lower uterine segment may be excessively distended, predisposing to uterine rupture and perforation (compare § 42).

Rupture of the pelvic articulation occurs rarely from the pressure of the foetal head, more frequently through the premature raising of the forceps handles, especially in combination with oscillating movements. It has also been found that primary inflammation, osteomalacia, caries, tumors, and in the funnel-shaped pelvis the pressure of the head on the descending rami of the pubis and their consequent leverage upon the symphysis, are predisposing causes. Rupture of the symphysis is accompanied by an audible crack, sudden and violent pain, and causes abnormal mobility. Treatment consists in a firmly applied bandage encircling the pelvis.

Recently the operation of symphyseotomy, the division of the pubic joint, has been re-introduced with partial success, to restrict the indications for craniotomy. Its value must be more extensively demonstrated through hospital work before it can be universally performed.

The dangers to the child are interference with the placental circulation from the uterine tetanus caused by rapidly succeeding uterine contractions; also, in consequence of the long-continued pressure, there may result œdematous swelling, necrosis, depressions, fissures, and fractures of the foetal head. The foetal bones become excessively displaced (compare Figs. 69-71 and §§ 5, 23); this leads to the formation of

cephalhæmatomas and subdural extravasations (§ 5). Fractures may occur at the base of the skull and in the cervical vertebræ. The size of the foetus and its head can be estimated by abdominal palpation. It should be noted whether patient is a primipara or multipara; in the latter the head is of a large average size. It is of diagnostic and therapeutic importance to determine before labor—if possible from the twenty-eighth to the thirtieth week of gestation—the depth to which the head can be made to sink into the pelvic inlet.

In the management of labor in pelvic contractions it should be remembered that in seven-tenths of the cases complicated by pelvic deformity labor terminates without operative interference (Winckel).

Antisepsis must be scrupulous from the beginning, even if it is clear that an operation will probably not be required; then the inevitable lacerations and abrasions rarely become the focus of septic invasion. The expectant treatment consists in a careful observation of the descent of the head (degree of caput succedaneum) and force of uterine contractions. The use of the abdominal muscles is interdicted during the first stage and until the head has passed the inlet. Hot applications and sinapisms to the abdomen, morphine, chloral, and chloroform may be indicated. The woman should be placed upon that side toward which the presenting part tends to be displaced. (The indications for operation are found in § 22.)

Version is indicated if the head is above the brim and movable; in mento-posterior presentations, when conversion into an occiput presentation has failed; if the child is alive and the true conjugate is above

8 cm. When the head is deeper and fixed apply the forceps, otherwise craniotomy (lower limit of true conjugate 6.5 cm.); if below this, there is absolute indication for Cæsarean section.

## § 22. THE GENERALLY CONTRACTED PELVIS.

1. THE GENERALLY CONTRACTED PELVIS is due to arrest of development, without rachitis. It resembles the normal in form and symmetry; in some cases infantile arrests of development occur. Bones are of normal strength; there is usually a simple diminution of the normal pelvis. During pregnancy, uterine displacements are rare, but the lower portion may, near term, descend into the lesser pelvis; hence cephalic presentations are the rule. In labor, owing to the increased resistance, which is uniform in every direction, the chin is approximated to the chest in the pelvic inlet, hence there is marked Roederer's obliquity, often combined with Solayres' obliquity, *i.e.*, engagement in the oblique diameter. The cephalic plane (32 cm.) which corresponds to the small oblique diameter (9½ cm.) of the foetal head, with the small fontanelle, readily felt in front, advances. Rarer and unfavorable, when the uterus is on the right side (hence the parturient should not be allowed to lie on the right side), is the anterior frontal presentation (with 34 cm. fronto-occipital periphery and 12 cm. straight diameter). In the rare cases of pelvic presentation the head passes in an analogous flexed position. The head is apt to become impacted (*paragomphosis*); hence the pains are liable to cease early, and rarely rupture may result; more often,



necroses from pressure and friction, or erosions. Eclampsia occurs with notable frequency (from pressure on the ureters). Prominent caput succedaneum is found.

Four classes of generally contracted pelvis are noted:

*a. Infantile*, in persons generally well grown (Fig. 2). In this form the promontory is high up and slightly prominent, sacrum more extended, symphysis less inclined, transverse diameter normal, and the posterior superior spines farther apart.

*b. Simply contracted*, with masculine, strong bones. This has the same qualities as the infantile form, but with remarkably strong bones.

*c. Dwarf pelvis* (pelvis nana), which has delicate bones, normal proportions, marked transverse curvature of the sacrum. Infantile form: cartilaginous connections of the bones of the sacrum and the ossa innominata. Slight width of the wings of the sacrum in proportion to the vertebræ. Pelvic outlet contracted. Promontory slightly prominent. Transverse diameter normal.

*d. Generally contracted, rachitic*, is caused by rachitis. All measurements are shortened, especially that between the spines (Fig. 2). Differs from the infantile pelvis by its angular, unpleasant form (see Fig. 2), by its prominent pubic crest, rachitic form and position of the sacrum (see under rachitic pelvis), increasing dilatation in the pelvic outlet. Probably not so very rare as is claimed. The relation of the spines to the crest is normal. Promontory not prominent, but diagonal conjugate is shortened; distance between the posterior spines is increased, *i.e.*, not



rachitic; pelvic circumference lessened by about 7 cm. When the shortening of all the diameters does not exceed 2 cm. delivery is not materially obstructed.

*Diagnosis.*—True conjugate between  $9\frac{1}{2}$ – $10\frac{1}{2}$  cm., never less than 8 cm. in infantile pelvis.

*Treatment.*—When the true conjugate measures between 8 and 9 cm., induction of premature labor\* in the thirty-fifth or thirty-sixth week; or else, commencing with the time when the child becomes viable, the skull should be pressed firmly into the pelvic inlet for one and a half minutes every week (for the compressibility of the skull and its size, see § 5, appendix); otherwise forceps.† When the true conjugate measures more than 9 cm., expectancy, parturition in the lateral position corresponding to the side in which the occiput presents. Version is to be recommended only in exceptional cases.

\* *Table for the Induction of Premature Labor.*—True conjugate 8 cm., in the thirty-fifth week;  $7\frac{1}{2}$ –8 cm., in the thirty-first to thirty-fourth week;  $7\frac{1}{2}$  cm., before the end of the thirtieth week. This applies also to the flat pelvis. When the true conjugate measures 6 cm. induction of abortion is usually required.

† *Table of Indications for Forceps and Perforation* (see § 21).—Pelvic contraction of the first degree, true conjugate  $8\frac{1}{2}$ –10 cm.; second degree, 7– $8\frac{1}{2}$  cm.; third degree,  $5\frac{1}{2}$ –7 cm. With 7 cm. the application of the forceps is still possible under favorable conditions; 8 cm. is the usual limit. With the true conjugate less than 6.5 cm. in generally contracted pelvis and 5.5 cm. in flat pelvis a mutilated child can no longer be extracted. With flat pelvis having a true conjugate diameter of less than 8 cm. even spontaneous delivery of full-term children has been observed. These indications, based on the size of the true conjugate, are to be formulated of course according to the intensity of the pains, the preparation of the parturient canal, and all other concomitant factors.

## § 23. THE JUSTO-MINOR PELVES.

(Figs. 85, 89, 101, 78, 6, 11, 60, 61, 63, 69-71, 67, 92-94.)

2. FLAT, NON-RACHITIC PELVES comprise two classes:

*a. The simple flat, non-rachitic*, erroneously called also Deventer's pelvis, is caused by arrest of development. It is the most frequent pathological form. There is shortening of the true conjugate of the inlet, also, to a minor degree, of the straight diameters of the true pelvis, *i.e.*, the sacrum, without being turned on its transverse axis (as in the rachitic form), is advanced forward, *in toto*, and is narrow in all its parts. Thereby the posterior superior spines project far backward and are approximated (contrary to what obtains in the generally contracted pelvis). During pregnancy, changes of shape in the uterus (see §§ 33-35, Figs. 101, 85-88) and abnormal presentations and positions of the foetus are met with more frequently than in the generally contracted pelvis. In labor, since the pelvis is narrowed from before backward, but wide enough transversely, the sagittal suture engages in the transverse diameter of the pelvis, and during the slow descent of the head it is displaced in two directions at the same time: (*a*) it ascends at the promontory with the posterior parietal bone, whereby the sagittal suture approaches the promontory (Nägele's obliquity); (*b*) the smaller bi-temporal transverse diameter (8 cm.) passes into the true conjugate, *i.e.*, along with Nägele's obliquity or anterior vertex presentation there ensues anterior frontal presentation—the large fontanelle is felt first

on palpation. In this transverse position the head descends to the pelvic outlet. In lumbo-sacral lordosis (especially in pronounced scolio-rachitic pelves) with greatly shortened conjugata vera the head engages as in generally contracted pelves, in a hyperflexed position, but is fixed extramedially (Fig. 78) in one half of the pelvic inlet. In pelvic presentations the most favorable way is when the chin engages first (*i.e.*, in the smallest suboccipito-bregmatic periphery = 32 cm.), otherwise it is liable to catch on the horizontal ramus of the os pubis.

*Diagnosis.*—True conjugate 8-10 cm., usually more than 9 cm.

In calculating the length of the true conjugate from the diagonal in flat pelves, it must be remembered that the symphysis has a lesser inclination, in consequence of which fact the diagonal conjugate is relatively larger; instead of deducting from it 1.5 cm. we must subtract 1.8 to 3 cm. (the latter in rachitic pelves) in order to obtain the length of the true conjugate. The sacrum inclines but little. The promontory is often double. The relation of the spines to the crest is normal, *i.e.*, not rachitic. The distance between the posterior superior spines is lessened. The transverse diameter is slightly shortened, the external and the diagonal conjugates are markedly shortened. As a rule only Skutsch's method will make the diagnosis certain (Figs. 6 and 11).

*Treatment.*—With a true conjugate between 8 and 8½ cm., induction of premature labor in the thirty-fourth to thirty-sixth week, perhaps version during labor; forceps only in deep transverse position of the head or after it has passed through the pelvic inlet

and the pains are becoming weak. In primiparæ, in whom the child's head is small and the pains together with abdominal pressure are stronger, expectancy at first, followed by forceps; in multiparæ, version. The rare and unfavorable posterior parietal presentation is to be corrected at the time when the head engages, otherwise version but not forceps; lateral position of the patient on the same side as the presenting forehead. The danger of rupture of the uterus is greater than with generally contracted pelvis. Of importance is the method given above under the head of generally contracted pelvis, viz., pressing the head into the pelvic inlet during the latter part of pregnancy.

*b. The generally contracted, flat, non-rachitic* (generally irregularly contracted, non-rachitic) is due to arrest of development. There is shortening of all diameters, most of all the straight and especially that of the pelvic inlet; being the consequence, not of the advanced sacrum, but of the rudimentary portions of the ilium around the inlet. Probably not so rare as claimed. The promontory is very high up and set back (hence in calculating the true from the diagonal conjugate 2 2.5 cm. must be deducted). For the effects of this pelvis upon pregnancy and labor, see the same form of rachitic pelvis.

### 3. THE FLAT-RACHITIC PELVIS has two forms:

*a. The simple flat-rachitic* (Figs. 61, 63, 69-71) is caused by rachitis. With a normal formation of cartilage and periosteum an insufficient quantity of lime salts is deposited, or the latter are absorbed in excess, the abundant dilated and distended blood-vessels in the bone-forming tissues causing an increased deliquescence of the cartilage and its

previously ossified portions (Fig. 67). The effect is twofold: 1. By pressure and traction; 2. By infantile arrest of development of the insufficiently nourished bones. Possibly, but not commonly, there may be an hereditary tendency. Pressure and traction act as stated in § 2, but excessively, owing to the softness of the bones. The relation of the spines to the crest is either equal or the former is greater, because the venters of the ilia are pressed back flat. This position at the same time is an expression of the flattening and the commonly increased absolute or at least relative transverse extension. Owing to lordosis of the lumbar vertebræ the sacrum is depressed forward deeply into the pelvis, as a rule, with the body of the vertebra, by reason of the excessive effect of the weight of the trunk during infancy when the rachitic softness of the bones was marked. The posterior superior spines therefore project far behind; their distance apart is lessened. The sacrum, as far as it articulates with the ilia (*i.e.*, to the third vertebra) is displaced backward, the rest of the sacrum and coccyx hangs down straight (see Fig. 70). The sacrum, like most of the bones, is smaller. The traction of the ligaments and muscles causes a still greater transverse extension of the pelvic outlet; the arch usually exceeds  $100^{\circ}$ . The symphysis is steep (therefore elongates the diagonal conjugate) and, like all the walls of the true pelvis, is low. Of practical importance, furthermore, is the fact that all synostoses, synchondroses, synarthroses, etc., form pointed bony projections which easily lead to ruptures of the soft parts (see under Acantho-pelvis, § 31, and Fig. 89).

During pregnancy we find very frequently uterine displacements, anteversion and anteflexion, with pendulous abdomen (see § 33 and Figs. 92-94, 100) or retroversion and retroflexion which may lead to grave incarcerations under the promontory (see § 34 and Figs. 85-88). Eclampsia, however, is rare, probably because the ureters are protected from pressure in the cavity beside the convex sacral vertebra. But for the same reasons there is during labor a greater predisposition to the prolapse of extremities or of the funis (five times more frequent), especially because (in the slow passage through the pelvic inlet of the head or in abnormal presentations) a very large bag of waters forms and generally ruptures early and prematurely, *i.e.*, before the head enters the pelvic inlet, which occurs in fifty per cent after the os is fully dilated. This engagement of the head takes place in the manner described above under the non-rachitic flat pelvis (see Pelvis 2*a*, Fig. 69). The efforts of the patient are usually much increased; the danger of rupture of the soft parts, especially from the above-mentioned sharp projections, or of the pelvic articulations is much greater (see § 31 and Fig. 89), and necroses and fistulæ are liable to ensue. Cephalic presentations are rarer by ten per cent; the duration of labor is lengthened fifty per cent. The caput succedaneum is large; the whole configuration of the skull is correspondingly altered or injury results, since the posterior parietal bone which hugs the promontory is pressed in or fissured, with resulting subdural hæatomas (Figs. 69-71). The pains are irregular, owing to the purely mechanical resistance and indirectly to the circulatory disturbances.



*Diagnosis.*—The true conjugate usually measures more than 8 cm. (compare remarks upon 1. Generally contracted pelvis). General rachitic habitus. The venters of the ilia are flat and directed backward. The distance between the anterior superior spines is equal to or greater than that between the crests. The promontory can be easily palpated. The external and the diagonal conjugates are shortened, but from 1.8–3 cm. must be subtracted in calculating the true conjugate. The protrusion of the promontory may be deduced also from the markedly prominent posterior superior spines and the diminished distance between them.

*Treatment.*—Analogous to that in non-rachitic flat pelves. It should not be forgotten that, owing to the steep position of the symphysis, the diagonal conjugate relative to the true conjugate is disproportionately greater than in non-rachitic flat pelves.

*b. The generally contracted, flat rachitic (Fig. 62)* owes its peculiarities to rachitis. The softer the bones and the earlier the disease, the more does the first sacral vertebra project and the more also are the antero-lateral walls of the pelvic inlet forced inward by the thighs, and the smaller is the development of all the osseous parts. It is a transition form to the compressed pseudo-osteomalacic pelvis, since it owes its form to a more pronounced and earlier softening than the simple flat rachitic pelvis, and thereby the flattening has become combined with a compression in the direction of the transverse diameters, more markedly in the latter direction than in that of the conjugate, through the action of the thighs. The result is a triangular form (Fig. 62) of the pelvic inlet.

Otherwise, in contradistinction to the rarer non-rachitic, generally contracted flat pelvis, it possesses all the characteristics of the simple flat rachitic pelvis, but the pelvic outlet is smaller. The traction of the muscles and ligaments is much more effective, however, than in the flat pelvis, the psoas muscles and the sacro-spinati acting upon the lumbar lordosis and upon the longitudinal extension of the upper sacrum; the ilio-sacral ligaments upon the outward rotation of the venters of the ilia. Concerning the effect of this form of pelvis upon pregnancy we note that the promontory projects far, but on both sides more "dead" space is left for the uterus and its contents; but the available remnant of space in the anterior pelvis has the pronounced characteristics of the generally uniformly contracted pelvis. Very frequent results are antelexion of the uterus with pendulous abdomen (Figs. 92-94, 105), irregular presentations and positions of the child, and abnormal forms of the uterus (transversely elliptical, round, or oblique). In labor: the head engages here also with the sagittal suture in the pelvic transverse diameter of the inlet; finally, the occiput descends deeply as in the generally contracted pelvis in a posterior parietal presentation. The anterior parietal presentation is most unfavorable. Rotation around the small oblique diameter follows very late. In pelvic presentations the chin first enters the pelvic inlet, and here again the small suboccipito-bregmatic periphery (=32 cm.) passes through; if not, the condition is very unfavorable. Prolapse of extremities or of the funis is easily explained by the presence of the "dead" spaces alongside the promontory. Besides,



we are apt to encounter ruptures of soft parts and pelvic articulations, voluminous caput succedaneum, lesions of the parietal bone which hugs the promontory (subcutaneous and subdural hæmatomas, Figs. 69–71) as a result of the greatly retarded labor and the triangular form of the pelvic inlet which is least adapted to the foetal skull.

*Diagnosis.*—The true conjugate is often less than 8 cm. (compare remarks upon 1. Generally contracted pelvis). There are marked general evidences of rachitis. The patients are small. We find all the signs of the simple flat rachitic pelvis and in addition a shortening of all the transverse diameters, including that of the pelvic outlet. The pelvic brim is readily palpable.

*Treatment.*—Induction of premature labor when the true conjugate measures 8–9 cm. in the thirty-second to thirty-sixth week, or forceps with posterior parietal presentation. Craniotomy or Cæsarean section usually with anterior parietal presentation, and invariably when the true conjugate measures less than 8 cm.

## § 24. COMPRESSED PELVES.

(Figs. 67, 68, 64, 65, 70.)

*c. The compressed rachitic or pseudo-osteomalacic* (Fig. 64) has a rachitic origin. The bones being extremely soft owing to the resorption of previously formed lamellæ of lime salts, pressure and traction acting on the parts most exposed to their effects cause them to yield. These parts are the acetabula and the promontory. Secondly, the symphysis projects beak-like, and the small, shallow venters of

the ilia are displaced especially far backward. The pelvis resembles the heart-shaped osteomalacic pelvic inlet; the promontory has sunk far forward, the acetabula are pressed deeply inward, and as a result the symphysis projects beak-like. The tuberosities of the ischia are approximated. During pregnancy the uterus is high up owing to the failure of the presenting part of the child to enter the true pelvis, oblique presentations, etc. In labor spontaneous or even instrumental delivery is practically impossible.

*Diagnosis.*—The promontory in particular is deeply sunken in, the symphysis is beak-like, the innominate line in its characteristic form can be readily palpated. Pronounced general symptoms of rickets. The length of the true conjugate has no bearing upon the labor.

*Treatment.*—Cæsarean section almost exclusively.

4. THE OSTEOMALACIC COMPRESSED PELVIS (pelvis halisteretica, Fig. 65) is due to osteomalacia. The lime salts are resorbed from the fully developed bones and therefore are not replaced by cartilage as is the case in rachitic children; the decalcified fibrous tissue remains (Fig. 68). Contrary to what obtains in rachitis, we have an inflammatory process, causing decalcification with consequent dilatation of the Haversian canals and of the medullary cavities. The osseous tissue with its contained lime salts and bone corpuscles is replaced by lamellar connective tissue; hence result the flexible pelvis in osteomalacia cerea. (Osteitis is associated with osteoporosis.) In the beginning of the softening the pelvis is transversely contracted, as the changes under the pressure of the thighs start from the anterior pelvic wall. Further results are the characteristic changes just described

under the head of the pseudo-osteomalacic pelvis, culminating in extreme deformities and compression, so that even digital exploration through the vagina becomes impossible by reason of the close approximation of the tuberosities of the ischia, and the pubic arch has disappeared or has acquired a figure-eight shape. The sacrum in its middle portion is lifted far backward, yet, contrary to the rachitic pelvis (see Fig. 70), its point is drawn forward, so that this bone with the coccyx is very concave and narrows the outlet greatly in the straight diameter. The venters of the ilia are flexed, with a groove (iliac sulcus) passing obliquely forward and upward from the ilio-sacral articulation to the crest or the anterior spines. The frequent infractions arise from medullary softening with intact cortex. The so-called rubber pelvises are very soft and yielding. The course of labor depends altogether on the degree of softening of the bones. When the osteomalacia has run its course the pelvis is fixed in its pathological form and birth is impossible; hence in the diagnosis during pregnancy it should be noted whether the retroflexed uterus is incarcerated (see § 34 and Figs. 85-88) or whether there are signs of the active disease, viz., pains in the bones (first in the upper pubic rami), muscular cramps, softness of the bones (first about the pelvic outlet), and especially the peculiar waddling gait. In the latter event spontaneous delivery is possible in many cases (stated as between seventeen and eighty per cent) by distention of the pelvis; otherwise nothing is left, as a rule, but Cæsarean section. Whether the latter should be combined with castration or hysterectomy according to Porro, with a

view to curing the disease, is still an open question which cannot be discussed here. Possibly the induction of premature labor may have to be considered. Besides, it is necessary to ascertain exactly the capacity of the pelvic spaces. The characteristic form of the pelvis is indicated to the observer by a transverse fold of the skin above the pelvis, by the beak-like symphysis with its upper displacement, the contracted pelvic outlet, and the lessened distance between the trochanters (see §§ 1, 5).

*Treatment.*—During labor attention should be paid to the distention of the lower uterine segment (see §§ 8, 42), since rupture of the uterus is liable to occur. When this segment is greatly distended version is contraindicated; aside from version, under favorable circumstances, the forceps or more rarely craniotomy may have to be considered, or instead of the latter Cæsarean section.

## § 25. FUNNEL-SHAPED PELVES (see § 30).

(Figs. 72, 3, 73, 74, 5, 76.)

5. FUNNEL-SHAPED PELVIS WITH OUTLET CONTRACTED GENERALLY, TRANSVERSELY, OR SAGITALLY.—Pelves with contracted outlet occur also with the generally and the flat contracted pelves, and, furthermore, in spondylolisthesis, osteomalacia, and bilateral synostosis, which see. General characteristics: contraction, especially and most frequently of the transverse diameter of the outlet (Fig. 5, §§ 1, 5), next to that, of conjugate of the outlet; often there is a combined contraction of all the diameters of the lower pelvic apertures. In pregnancy, since the pelvic inlet

is normal or round or sagittally oval, with only moderate contraction, the presenting part regularly descends into the true pelvis, hence there are no uterine displacements, etc. Not until labor is progressing does the advancing presenting part meet with serious resistance, as it can find no way of escape. Normal rotation in the straight diameter is effected by the ischial spines (§ 5); these, forming as they do the smallest diameter of the pelvis, prevent this rotation, owing to their approximation and that of the tuberosities. The head, for instance, remains with the sagittal suture oblique or transverse, *i.e.*, the largest cephalic diameter is in the smallest transverse pelvic diameter, when the occiput often deviates backward at the ischial spine. But when the skull has thus reached the ischial spine, it has not only passed the pelvic inlet, but the greater part of the child's trunk has escaped from the contracting fundus. This causes cessation of the activity of the uterus; rarely there is danger of rupture by traction and distention, more frequently of pressure necroses of the vagina, vesico- and urethro-vaginal fistulæ, etc.

*a. Infantile undeveloped pelvis* (Fig. 72) is due to arrest of development; abnormally high position of the promontory, with shallowness of the sacrum (perhaps with early though not abnormal ossification). By these means the generally infantile character of the pelvis is preserved and the effect of the weight of the trunk is displaced backward, so that no transverse stretching of the pelvis can result. Thus the infantile characteristics are increased. Special characteristics: While the form of the rest of the spinal column is normal and the sacrum likewise is often

normal in shape and position, and the promontory accordingly is frequently in its normal position, the main alteration is to be found in the contraction of the lower pelvic apertures, especially the transverse. The sacrum usually has but a slight inclination, is long and narrow, not solely as a result of marked transverse and slight longitudinal curvature, as discovered by Schauta, but also in pelves with elevated promontory and shallow sacrum, since the body of the first sacral vertebra is much above the alæ, and thus transforms the transverse distance into two descending lines. The pelvic inlet is usually rounded and tending toward a sagittally oval form—a result of the condition of the sacrum (high position with marked transverse curvature, and adjoining it immediately in front the arches of the ilia). The inclination of the pelvis is somewhat greater than the average and the symphysis is rather steeper—like-wise infantile qualities. We have to deal with a simple infantile arrest of development in the case of normal shape and position of the sacrum, but a funnel-shaped outlet.

*Diagnosis.*—Demonstration of the transverse contraction of the outlet (Fig. 5, § 1) or of its conjugate, with normal dimensions of the greater pelvis or of its inlet. The tip of the sacrum can be easily palpated.

*Treatment.*—In moderate degrees expectancy, then forceps; with a transverse diameter of less than 8 cm., craniotomy or Cæsarean section. Caution is required in the use of the forceps, so as to avoid extensive bruising, etc., or separation of the articulations.



*b. Fœtal undeveloped pelvis* (Fig. 3), "bedfast pelvis," or pelvis of recumbency, is due to prolonged decubitus with entire disability of motion or sitting. The spinal column retains nearly the foetal straight form, and the sacrum accordingly is in almost direct continuation of the axis of the vertebral column, while the promontory is slightly marked and elevated. The inclination of the pelvis remains largely as in the foetus, and while the physiological ante flexion of the pelvis does not take place, neither does the second rotation described in § 2, which would lift the anterior pelvis. Transverse distention fails to occur, the sacrum remains narrow and stretched, and the venters of the ilia continue shallow and small. The pelvic inlet accordingly is round or sagittally oval; the true pelvis is markedly funnel-shaped throughout. Labor has never yet occurred, because of the equally undeveloped genital organs.

*c. Lumbo-sacral kyphotic funnel-shaped pelvis* (Figs. 73, 74, 76) is due to rickets or caries of bone in the lumbo-sacral or lumbo-dorsal region. The kyphotic lumbar vertebræ drag the upper sacral vertebræ upward and backward with them; the promontory becomes flattened and moves higher up. In order to maintain the equilibrium of the body the anterior portion of the pelvis must be lifted, *i.e.*, the pelvic inclination must be lessened. In this position the sacrum cannot efficiently transmit the weight of the trunk and effect transverse distention; the posterior superior spines are approximated, the venters of the ilia are shallower because the tension is taken off the ilio-sacral ligaments by the absence of the forward and downward pressure of the sacrum. On the other

hand, the lower arms of these levers approximate the ilium and ischium, *i.e.*, they cause transverse narrowing of the outlet. Besides, the sacrum turns its lower extremity forward, causing sagittal contraction of the outlet. The convexity, or the transverse straightening, of the sacrum, together with the separation of the ilia are the sole signs of rachitis in these cases. Pendulous abdomen is frequent, by reason of the lordosis of the upper portion of the vertebral column with the resulting encroachment upon the abdominal cavity. In labor we find longitudinal positions, usually with a predilection of the oblique diameters of the pelvis for the longest diameter of the presenting part.

*Diagnosis.*—The history of the time of the affection of the vertebral column will point to changes of growth in the pelvis. The venters of the ilia are wide, the symphysis is prominent, the pelvic inclination slight. The pubic arch and the diameters of the outlet are narrowed. The parts alongside the innominate line are reached with facility, the promontory with difficulty if at all: these points will differentiate this form from spondylolisthesis.

The course and *treatment* are the same as in the infantile funnel-shaped pelvis.

*d. Pelvis obtecta s. spondylizema* (descent of the lumbar vertebræ). As above, but the kyphosis is compensated by marked lordosis of the lowest lumbar vertebra. The deep-seated kyphosis is compensated immediately above the pelvic inlet by superincumbence of the lowest lumbar vertebra over the inlet, hence the name *pelvis obtecta*, *i.e.*, resembling the spondylolisthetic pelvis. Its effects upon pregnancy



and labor, its diagnosis and treatment are like those of the preceding form.

*e. Kypho-scoliotic funnel-shape pelvis* is caused by rickets. It is characteristic when the sacrum participates in the kyphosis. On the scoliotic side (generally the left) the pelvic inclination is slight, on the opposite side it is very marked. This oblique deformity is combined with the funnel-shape of the purely kyphotic pelvis. At the outlet the deformity is reversed. For further details see under scoliotic obliquely deformed pelvis.

## § 26. OBLIQUELY DEFORMED Pelves.

(Figs. 78, 77, 81, 79.)

6. OBLIQUELY DEFORMED OR CONTRACTED Pelves are of four classes:

*a. By scoliosis or lordo-scoliosis*, due to rickets (non-rachitic and late acquired kypho-scoliosis cause no changes of form in the pelvis). On the side of the scoliosis greater weight bears upon the pelvis, and hence that wing of the sacrum is more deeply depressed. By the corresponding pressure of the thigh the os pubis is displaced toward the opposite side. The combination of kyphosis with lordosis produces a vertebral torsion, the spines of the vertebræ pointing in the opposite direction. The resulting abnormal traction of the ilio-sacral ligaments drags the venter of the ilium along. This traction, combined with the pressure of the thighs, lifts the venter with the entire half of the pelvis corresponding to the scoliosis and makes it steep, the anterior edge of the venter being approximated to the median line of the pelvis.

The oblique deformity is effected either in the direction opposite to the pathologically stunted wing of the sacrum, *i.e.*, in the sagittal line of the last lumbar vertebra, or in the direction corresponding to the diseased hip-joint which the patient has favored. The lumbo-dorsal main scoliosis is compensated by the deformity of the pelvis, either by the compensatory scoliosis of the sacrum alone toward the opposite side, or by an associated twisting of the last lumbar vertebrae. In general, however, the direction of the latter determines that of the pelvic deformity, and on the same side occur the depression of the wing of the sacrum, the tilting and the inward rotation of the venter of the ilium; this half of the pelvis is higher than the other, while its os pubis is flatter. Hence result (1) shortened conjugata vera, (2) shortened sacro-cotyloid line of the same side, but (3) lengthened oblique diameter, owing to the depressed sacro-iliac articulation on this side. The tuber ischii of the scoliotic side usually points outward, thus widening the pelvic outlet. Otherwise all the characteristics of the rachitic pelvis are present. The higher degrees of contraction associated with the deformity cause the same difficulties during pregnancy as appear with markedly flat pelvis. As indicated schematically in Fig. 78, and described under the head of the flat non-rachitic pelvis (2 *a*), in this variety of pelvis the head may often meet with so much resistance in one half of the pelvis (the flattened half corresponding to the scoliosis) that extra-medially it avails itself only of the other half, and this latter presents to it the same resistance as a generally contracted pelvis (see above), *i.e.*, the suboccipito-breg-

matic periphery descends most readily with deep-standing, small fontanelle. High degrees of such contractions are very unfavorable.

*Diagnosis.*—We must establish the existence of general rickets and the age at which it began, the general rachitic qualities of the pelvis, and finally, the oblique deformity, by palpation, or by measuring the height of the venters of the ilia from the free edge of the ribs, and the amount of torsion of the vertebral spines. The more marked oblique deformities find expression in differences between the two external oblique diameters (§ 1); the more these differences are shared by the following Nägele's and other measures the more positively can be diagnosed, according to my investigations, even the slighter grades of oblique deformity.

	Average during life.
1. The external diagonal of the major pelvis, . . . . .	22.5 cm.
2. The width of the ilia (posterior superior spine to anterior superior spine), . . . . .	16.8 "
3. The height of the pelvis (highest point of the crest of the ilium to the tuber ischii), . . . . .	22.2 "
4. The distance from the posterior superior spine to the tuber ischii of the opposite side, . . . . .	20.8 "
5. The distance from the anterior superior spine to the spinous process of the lumbar vertebra, . . . . .	18.5 "
6. The distance from the anterior superior spine to the tuber ischii of the opposite side, . . . . .	24.0 "
7. The distance of the posterior superior spine from the symphysis, . . . . .	18.0 "

*Treatment.*—At first expectant. During pregnancy, commencing with the thirtieth week, the foetal head should be pressed into the pelvic inlet for ninety seconds every eighth day. In cases of very marked shortening of the sacro-cotyloid line the attempt

should not be made to turn the head as Martin advises, so as to bring the sagittal suture into the greater oblique diameter. The latter lies parallel to the flattened half of the pubis, and this half of the pelvis, as stated before, is often so narrow that it leaves no room for the frontal portion in the sacrocotyloid line, while in the reverse position both transverse diameters of the head can pass; that is to say, when they are parallel to the flattened side of the pubis, and the sagittal suture lies in the shorter oblique diameter, with the small fontanelle low down. When spontaneous labor is impossible, the only measures available are, as a rule, craniotomy or Cæsarean section.

*b. Pelvis obliquely deformed by sacral asymmetry* (so-called secondarily synostotic or Nägele's pelvis) Fig. 81. (For the asymmetrically obliquely deformed pelvis of assimilation see below, No. 11.) Caused by a congenital defect of the wing of the sacrum, with displacement of the ilium and usually with ankylosis. There are no inflammatory residues; an inflammation can lead to no such smooth absorption of the bone, nor can the ilium become displaced after the ankylosis which is given as the cause of the atrophy. While the innominate line becomes normally curved on the healthy side, the stretching is absent on the diseased side. The further flattening, displacement, and secondary synostosis are effected by the pressure of the thigh of the diseased side. One wing of the sacrum is wholly or partly lacking; at the same time there is usually synostosis of the sacro-iliac articulation. The corresponding venter of the ilium is steep, twisted medially, and dislocated *in toto* upward and

backward. The corresponding pubis is flat; the symphysis is displaced toward the opposite side; the sacro-cotyloid line of the same side is also shortened, and the tuber ischii is displaced upward and inward, or backward. The other half of the pelvis is normally developed. The pelvic walls of the diseased side as far as the outlet are approximated. The obliquely oval form preserves the same direction in all parts. The space available for parturition possesses the characteristics of a generally contracted pelvis with a triangular inlet, whose conjugate is represented by a line connecting symphysis and synostosis. The head advances, therefore, in maximal flexion, occiput forward. When the sacro-cotyloid line is greatly shortened, the remarks on the preceding pelvis apply. The pelvic outlet, contracted as it is, presents great difficulties. For this reason the prognosis of occipital presentations is rather unfavorable; of all other presentations it is bad.

*Diagnosis.*—Rickets or other inflammatory disease of the bones must be excluded. The varying elevation of the ilia must be determined. The innominate line should be most carefully palpated, and for the conjugate the distance of the symphysis from the synostosis is to be measured. Artificial labor is to be induced only when this distance amounts to 8.5 cm. and above. The oblique diameters should be measured as with the preceding pelvis.

*Treatment.*—The forceps can only do harm, and this is true also of version, since the head remains impacted. The choice, therefore, lies solely between induction of premature labor, craniotomy, and Cæsarean section.

c. *Pelvis obliquely deformed by inflammatory, primary, unilateral synostosis of the ilio-sacral articulation* from bone caries; the synostosis is primary; the age determines the form of the pelvis. All forms are met with, from extreme asymmetry, as in congenital Nägele's obliquity (a result of secondary synostosis) when arising in earliest infancy, to very symmetrical shapes.

*Diagnosis.*—The history of an inflammatory process, the demonstration of cicatrices, and the absence of displacement of the diseased ilium.

d. *Pelvis obliquely deformed by impaired function of the hip-joint* (Fig. 79). This is caused by coxitis; unilateral congenital luxation of the femur; also early amputation; comminuted fracture of one ilium or one wing of the sacrum (Fritsch). While all the bony parts of the coxitic half of the pelvis atrophy from the tuber ischii to the crest of the ilium, assume an extremely steep direction (as on the diseased side of the synostotic pelvis), and acquire a funnel shape, the pressure of the healthy thigh pushes its corresponding half of the pelvis toward the opposite side, hence the healthy half becomes flattened. The coxitic acetabulum may be perforated. The rarer variety of pure coxitis without pressure exerted by the thigh produces the contracted half, in analogy with the synostotic pelvis, on the diseased side with atrophy of one wing of the sacrum. In the first-described form this atrophy does not always occur on the healthy side, in which case the sacrum turns on its longitudinal axis. Contrary to what we meet in the Nägele pelvis, the obliquely oval form, the inclination between the inlet and outlet varies,



because the ischium of the healthy side is forced out; or the deformity decreases farther down, owing to a forward and outward movement of the two ischial tuberosities. In unilateral luxation of the femur (usually backward and upward) various forms arise, depending upon the age, and upon the use of the extremities. (*a*) Congenital luxation. The child is recumbent: atrophy of the diseased half of the pelvis; the pressure of the thigh upon the outer side of the ilium gives the latter a steep inclination. The tuber ischii is drawn upward by the traction of the trochanteric muscles. As the diseased tuber ischii is higher, the child sits upon the latter; this causes oblique deformity in favor of the healthy side. The child walks chiefly upon the healthy thigh; hence the pressure is now reversed and the diseased half of the pelvis becomes wider. (*b*) Acquired luxation. In early age, the extremity not being used, the form of the pelvis is the same as in congenital luxation with non-use and slight atrophy. In adults, the extremity not being used, the diseased half of the pelvis becomes wider (by the traction of the ilio-femoral ligament and the psoas muscle). When the extremities are used, both in children and in adults, the form of the pelvis is the same as in congenital luxation under use of the limb, but it is free from atrophy and there is less displacement toward the diseased side.

*Diagnosis* and *treatment* as in the preceding forms of obliquely deformed pelvis.

## § 27. TRANSVERSELY CONTRACTED PELVES.

(Fig. 111.)

7. TRANSVERSELY CONTRACTED PELVIS is of two varieties:

*a. Transversely contracted by absence of both wings of the sacrum* (Robert's pelvis). Other transverse contractions occur as simple arrest of development, viz., sagittally oval (funnel-shaped pelves); the round pelves constitute the transition form. The transverse contraction by absence of both sacral wings is caused by arrest of development (in birds, bats, etc., also by consolidation of the ilio-sacral articulation; the form of pelvis resembling that of most mammals). The primary factor is the absence of centres of ossification; the synostosis is secondary.

Consolidation of both ilio-sacral articulations exists with resulting enormous transverse contraction; that is to say, both halves of the pelvis are formed like the diseased half of the Nägele pelvis, with which it shares occasionally the asymmetry in transition forms. The ilia are displaced upward and backward upon the sacrum.

*Diagnosis.*—The distance between the trochanters, beak-like symphysis, the enormous contraction of the whole true pelvis, together with backward displacement of the sacrum.

*Treatment.*—Induction of abortion (the os is difficult of access, owing to the narrowness of the true pelvis) or Cæsarean section.

*b. Transversely contracted by primary inflammation and secondary bilateral synostosis.* This is due to



caries. (Up to the fifth year the wings of the sacrum grow in width by the formation of cartilage. Growth is not completed until the fourteenth year.) Analogous to the obliquely deformed pelvis described under *c*, except that the process in the present form is bilateral. Even the slighter grades show a funnel shape.

## § 28. PELVIS CHANGED BY CONGENITAL OR EARLY ACQUIRED DEFECTS.

(Figs. 3, 82, 83.)

8. DEFORMED BY BILATERAL LUXATIONS (Fig. 82), club-foot, absence of lower extremities, etc. The pelvis of recumbency (Fig. 3) has been discussed under the head of foetal undeveloped funnel-shaped pelvis, § 25. The "sedentary" pelvis is sagittally contracted and transversely stretched, like the pelvis of double luxation. The pelvis of club-foot is transversely contracted. Pelves deformed by bilateral luxations are congenital or acquired early by traumatism. Congenital.—*a*. Development of the head of the femur in abnormal location, above on the ilium, with non-development of the acetabulum. *b*. The same, with development of the acetabulum. Conjugate measures rarely less than 9 cm., usually between 9 and 10 cm. In *bilateral club-foot*.—The leg is moved like a rigid staff, with backward impacts upon the acetabulum and tuberosity: marked inclination of the pelvis. Owing to the backward displacement of the acetabula and tuberosity (see etiology), there are marked pelvic inclination, projection of the promontory, and great transverse contraction of the entire pelvis. In the *absence of both lower extremities*, i.e., the

“sedentary” pelvis, the form is analogous to that in bilateral luxation, viz., great transverse expansion, but approximated crests; marked flattening. In cases of bilateral luxation the centre of gravity being displaced backward, the lumbo-sacral portion and the sacrum are pressed respectively forward and backward; the promontory and the tip of the coccyx are crowded forward, the middle of the sacrum backward. The transverse expansion of the entire pelvis is increased, as is the pelvic inclination, while the true conjugate is shortened. The ilia are steep. During pregnancy, pendulous abdomen occurs. In labor indications for operation are the same as in the flat pelvis, hence we must at first remain expectant, especially because the great width of the pelvis and its lessened height sometimes cause precipitate labor. The operations are performed with difficulty, on account of the pronounced adduction of the thighs. *Diagnosis*.—Waddling gait. Pendulous abdomen owing to lumbar lordosis and shortened conjugata vera. The pelvis is very broad, with the trochanters on the outside of the venters of the ilia, so that the former are no longer cut by Nélaton’s line (from anterior superior spine to the tuber ischii). The thighs are adducted and rotated inward. In the differential diagnosis from spondylolisthesis attention must be directed mainly to the course of Nélaton’s line and accurate measurement.

9. FISSURED PELVIS (pelvis fissa) Fig. 84, of congenital origin, is usually associated with ectopia of the bladder. The pressure of the trunk and thighs causes pronounced characteristics. In the foetus the symphysis is separated 3–6 cm.; in the adult, 8–15

cm. Transverse expansion of all parts is marked; the sacrum is very prominent; the distance between the anterior superior spines is increased, that between the posterior superior spines diminished. Rarely there is synostosis of the ilio-sacral articulation, whereby function is restored. The thighs are widely separated. The characteristics are those of the too roomy pelvis. After labor the uterus always prolapses, otherwise labor presents no difficulties.

### § 29. SPONDYLOLISTHETIC PELVES.

10. SPONDYLOLISTHETIC PELVIS (Fig. 80) is of four degrees: (1) The body of the fifth lumbar vertebra projects beyond the base of the sacrum, (2) it is inclined over the pelvic inlet, (3) it glides into the latter, (4) it lies entirely in the true pelvis. (The last degree may cause fracture.) The spondylolisthetic pelvis is caused by direct traumata (and inflammatory processes). The interarticular portion is elongated; it represents the point of coalescence between the anterior and the posterior foetal centres of ossification. If this coalescence fails to occur, ligamentous masses effect the fixation (as a not very rare interarticular spondylolysis) which forms a predisposition to subsequent spondylolisthesis. The pelvic inlet is narrowed by the forward projection of the body of the fifth lumbar vertebra beyond the first sacral vertebra; in this way is produced a lordosis of the lumbar portion, whose middle vertebræ face the elevated symphysis; while the sacrum, as in the funnel-shaped pelvis, is inclined backward in its upper portion and forward in its lower portion. The factors determine

the degree of contraction. The lateral interarticular parts of the last lumbar vertebra become elongated (see Fig. 80) and thereby the forward gliding of the spinal column is arrested. The vertebral bodies enter into synostotic connection. The pelvic inclination is nearly abolished; the transverse expansion of the major pelvis is increased; the inlet is slightly, the outlet is greatly contracted. All the straight diameters are shortened. During pregnancy the abdomen is pendulous. Oblique presentations are liable to occur; the marked lumbar lordosis in a slightly inclined pelvis affects labor injuriously: the head is unable to follow the lower pronounced inclination of the pelvic cavity. The degree of deformity on the one hand permits spontaneous delivery, on the other hand leaves nothing but Cæsarean section.

*Diagnosis.*—The history of a trauma in early life. Lumbar lordosis with wide prominent hips; thorax sunken toward the pelvis, with corresponding folds of the skin. Pelvic inclination abolished, with rima pudendi pointing forward. The presence of the angle of descent (commencing slightly at the lumbar portion and palpable below), and the marked gibbous flexion between the kyphotic sacrum and the lordotic lumbar portion behind are of importance in the differential diagnosis from the rachitic and the lumbo-sacral kyphotic pelves.

*Treatment.*—With a conjugata pseudo-vera of 6 cm., there is an absolute indication for Cæsarean section; 6–7.5 cm., craniotomy or Cæsarean section; 7–8 cm., induction of premature labor in the thirty-second to thirty-sixth week; 8–9 cm., expectancy. Never podalic version.

### § 30. Pelves of Assimilation (INTERPOSED VERTEBRA).

(Figs. 74 and 75.)

11. PELVIS OF ASSIMILATION OR FORMATION OF AN INTERPOSED OR TRANSITION VERTEBRA is of two varieties :

*a. The asymmetrical pelvis of assimilation* (Fig. 75) is due to arrest of development or progress (atavistic). Either the twenty-fifth vertebra has not yet assumed on both sides the sacral character or the twenty-fourth is already incompletely sacral. On the one side a fully coalesced ala has developed, on the other the transverse lumbar process still persists. In this way the incompletely developed vertebra is insufficiently supported and sinks down ; then follows lumbar scoliosis and, later, oblique displacement of the pelvis toward the opposite side. When associated with rickets these peculiarities are particularly marked. The oblique displacement does not occur when the lower vertebra extends its auricular surface higher up and thus supports the incomplete upper half of the vertebra.

*b. The symmetrical pelvis of assimilation* (Fig. 74) has the same etiology as the asymmetrical, but on both sides either the twenty-fourth vertebra has already developed into a sacral vertebra (upper assimilation) or else it is the thirtieth which thus develops (lower assimilation). In upper assimilation (the whole of the twenty-fourth vertebra being already sacral) the promontory is high up, the interarticular cartilage between the first and second sacral vertebræ persists, and the angle of the promontory is slightly developed. The result is a slighter curvature of the

lumbar portion, the centre of gravity is displaced forward; in compensation the inclination of the pelvis is lessened and the trunk is slightly bent forward. By these means and by the ensuing diminished expansion and funnel shape the pelvis acquires kyphotic characteristics.

True interposed vertebræ occur in the form of arches without bodies, the latter being derivatives of the former (Gegenbauer, Rosenberg).

### § 31. Pelves Contracted by Bony Tumors or Exostoses from Fractures.

(Figs. 89-91.)

12. ACANTHOPELYS-EXOSTOSES (Fig. 89). Often in rachitic pelves there is ossification of the physiological ecchondroses of growth (Virchow). Pointed exostoses occur at the points of the synchondroses or synostoses of growth—the symphysis, the ilio-pubic tubercle (acetabulum), the sacro-iliac synarthrosis, and the promontory. They cause erosions and ruptures of the uterus.

#### 13. TUMORS OF THE PELVIC BONES.

*a. Enchondromata* (Fig. 91) are heteroplastic, *i.e.*, not developed from pre-existing cartilages (Virchow). They have a tendency to ossify, and are found usually springing from the posterior pelvic wall and filling nearly the whole lumen of the pelvis; this applies also to fibromata. They generally necessitate Cæsean section.

*b. Fibromata* are rarely as large as the former.

*c. Sarcomata*, most frequently round-celled, spindle-celled, and soft medullary, usually springing from the posterior pelvic wall and very large.



*d. Cysts*, associated with sarcoma or enchondroma.

*e. Carcinomata* are metastatic in origin, rarely large; they cause osteoporosis, hence the bones are soft.

*f. Hydrorrhachis*, a fissural defect; secondarily, unilateral scoliosis and asymmetry. The sac must remain intact.

14. FRACTURES (Fig. 90) may be of the sacrum, or of a portion of the ilium or of the acetabulum, with or without callus exostoses, and with or without oblique contraction (in Fritsch's case this was due to fracture of the right wing of the sacrum).

### § 32. TOO WIDE PELVIS.

15 *a. Generally too wide*, a developmental anomaly. This occurs with ordinary stature and with giant growth. The increase of the several diameters rarely exceeds 2 cm. The straight diameters are particularly enlarged.

*b. Funnel-shaped wide pelvis* is an anomaly of development. The outlet is of normal width, the inlet is dilated.

*c. Pelvis widened by flattening of the venters of the ilia.* This is also a developmental anomaly. The inclination of the ilia toward the lateral walls of the true pelvis, instead of being  $130^{\circ}$ – $140^{\circ}$  as in normal women ( $150^{\circ}$ – $160^{\circ}$  in men), is  $105^{\circ}$ . During labor the head enters the true pelvis prematurely and passes rapidly through it; precipitate labor (see § 55) may ensue under powerful contractions and abdominal pressure. The head fails to undergo normal rotation and the occiput is liable to descend posteriorly, *i.e.*, there may be anterior parietal presentation.

## PART III.

### Displacements, Tumors, and Anomalies of Development of the Sexual Apparatus and Their Influence upon Pregnancy and Labor.

#### CHAPTER I.

##### DISPLACEMENTS OF THE UTERUS.

##### § 33. ANTERIOR DISPLACEMENTS AND PENDULOUS ABDOMEN.

(Figs. 101, 129, 69, 70, 29, 9, 92-94.)

Anteversion or ante flexion of the uterus which existed before pregnancy may persist when the abdominal walls are relaxed. Pendulous abdomen occurs most frequently with flat pelves, since the weight of the gravid uterus is then not sufficiently supported by the anterior pelvic wall. This condition gives rise to increased mobility and obliquity of the uterus, anteversion, or ante flexion. A predisposition to ante flexion is furnished also by the lessened area of the true pelvis in pelvic contraction, by the shortening of the abdominal cavity in scoliosis, and, in the first months, by the sagittally oval pelvis.

The abdominal wall presents predisposing factors when there are relaxation, diastasis of the recti muscles, thinning of the fasciæ and the skin; the ovum



does so when there is hydramnion (Figs. 92 and 129) or twin pregnancy.

In the first half of pregnancy the cervix points backward and the fundus rests against the symphysis;\* a truly pathological forward or backward displacement is possible only when the uterus is fixed. In the second half of pregnancy the fundus pushes forward above the symphysis either in the form of an obtuse angle with the anterior pelvic wall (first degree of pendulous abdomen, Fig. 93), or of a right angle so that the navel forms the acme of this pointed abdomen (second degree, Figs. 92, 94), or of an acute angle so that the fundus is at the same height as the cervix or below it (third degree, Fig. 101) and the abdomen rests upon the thighs when the patient is sitting and sometimes even when she is erect.

During labor there may be inefficient contractions or absence of abdominal pressure. Of more serious import are crowding of the head against the promontory, *i.e.*, approximation of the sagittal suture to the latter (compare Figs. 69, 70), or incarceration of the head at the symphysis with flexion of the spinal column, and approximation of the sagittal suture to the symphysis (posterior parietal presentation). For further details see Contracted Pelves, especially §§ 23, 24, 25 *c*, 26 *a* and *b*, 28 (No. 8), and 29.

Therapeutically the anterior displacement of the fundus uteri should be compensated by placing the

\* In this connection it should be noted that in the first two months the body of the uterus sinks physiologically by reason of its weight (Figs. 29, 9), thus forming an obtuse angle with the cervix. This process is repeated toward the end of pregnancy when the head descends low into the pelvis (Figs. 9, 29).

parturient in the dorsal position and by fixing the uterus backward by means of towels or bandages (for operative procedures see the sections just named).

### § 34. BACKWARD DISPLACEMENT OF THE UTERUS.

#### *Retroversion and Retroflexion of the Gravid Uterus.*

(Figs. 85, 86, 87.)

In retroversion of the gravid uterus the fundus is dislocated backward over the pelvic axis and the cervix points forward, without backward flexion of the axis of the body. When this deviation is associated with flexion it constitutes retroflexion of the gravid uterus.

When the fundus is below the promontory but higher than the external os, both displacements are of the first degree; when at the same height as the cervix, of the second degree; when lower, of the third degree. The uterus may be altogether upside down. At the end of the third month either the uterus passes forward along the promontory or the retroversion changes into a retroflexion which in rare cases may persist until term, constituting incarceration (Fig. 85). When a portion of the child escapes upward beyond the promontory, a partial retroflexion results (Fig. 86). Even then spontaneous reposition is possible by the upper parts escaping forward and downward, and the posterior lower parts rising.

The part (usually the head) at first situated in the sacral excavation may be crowded downward instead of upward and bulge out the perineum, or cause prolapse of the rectal wall, or, perforating the posterior vaginal wall, manifest itself through prolapsus of the

retroflexed gravid uterus (Fig. 87). Besides spontaneous reduction with or without abortion we may have as sequelæ: cystitis with abortion (retention of urine with sloughing and necrotic exfoliation of the vesical mucosa, Fig. 58), perforations of the rectum or vagina or rupture of the bladder, usually fatal, and uræmia. At times the foetus dies.

*Diagnosis.*—The occurrence of ischuria paradoxa in the absence of menstruation always calls for exploration to determine the position and size of the uterus. The angle of flexion which the cervix forms with the posterior tumor connected with it establishes the diagnosis. This tumor forces out the wide posterior vaginal vault in the shape of a firm ball.

*Etiology.*—Firm adhesions, flat pelvis, and tumors are predisposing factors.

*Treatment.*—The indication is first of all to replace the uterus after emptying the bladder and rectum. Reposition is to be effected by drawing down the cervix with Muzeux's forceps and pushing up the body of the uterus partly from the posterior vaginal vault, partly from the abdominal walls.

When reposition fails, puncture of the bladder or the induction of premature labor is indicated (by means of the sound, a curved bougie, or when the os is inaccessible, even by puncture of the uterus).

### § 35. PROLAPSUS OF THE GRAVID UTERUS.

(Figs. 88, 28, 30, 31, 34.)

Complete prolapsus of the gravid uterus occurs only during the first half of pregnancy (Fig. 88).

Incomplete prolapsus of the gravid uterus in consequence of cervical hypertrophy (when the height of

the fundus corresponds to the normal at the various periods of pregnancy, being elevated by the great tension of the vaginal walls and the connective-tissue bands mentioned in § 15 and Figs. 28, 30, 31, and 34) may be present during the whole course of pregnancy and has usually existed before. Otherwise it may arise without cervical hypertrophy from ovarian tumors (Fig. 88) and from external mechanical factors, such as coughing, intense straining during defecation, etc. In one-third of all cases it develops during labor, *e.g.*, in consequence of a rigid lower uterine segment, but not of an excessively wide pelvis or of a too wide rima vulvæ, provided the pelvic floor is powerful. In the second half of pregnancy the uterus maintains itself above the pelvic inlet. Post partum the prolapse is liable to recur.

During labor the rigidity of the cervix which is often present in chronic prolapsus forms a serious obstacle; in that event reposition is omitted and early incisions are made; otherwise forceps are applied or craniotomy is done.

Operation for prolapsus during pregnancy is positively indicated.

### § 36. HERNIA OF THE GRAVID UTERUS OR HYSTEROCELE.

(Fig. 95.)

The gravid uterus may form a part of inguinal or ventral hernias, but has never yet been observed in crural hernia. Spontaneous reposition, interruption of pregnancy, and natural labor have not yet come under observation with inguinal hernia.

The head of the child, as a rule, is turned toward

the hernial opening—a proof that the configuration of the uterus determines the position of the child.

The uterus may also be dragged into the hernial sac secondarily by adhesions. A few such cases are congenital, usually in uterus bicornis or unicornis.

In the diagnosis it is necessary to demonstrate the connection between the cervix and the tumor situated in the hernial sac; the discovery of parts of the foetus in the tumor establishes the diagnosis of pregnancy.

*Treatment.*—Reposition; that failing, induction of abortion, Cæsarean section, or ablation of the uterus or its horn (as in the case figured by v. Winckel), or else operative dilatation of the hernial opening (Müller).

---

## CHAPTER II.

### TUMORS OF THE GENITAL APPARATUS.

#### § 37. FIBRO-MYOMATA OF THE UTERUS.

(Figs. 96, 107, 97.)

Fibro-myomata of the uterus are met with in pregnant and puerperal women far less frequently than should be the case according to the experiences in gynecological practice. The cause lies partly in the sterility often existing with myomata, partly in the fact that the tumors usually develop after the thirty-fifth year of life, that is, in the last period of fertility. In part, too, especially if small, they fail to be recognized during pregnancy. On the other hand, the larger tumors have given rise to the erroneous diagnosis of twin pregnancy. Even if they do not cause

symptoms until pregnancy or during labor, they are usually pernicious in their influence upon mother and child:

First, by encroaching upon the space. The child either is unable to develop properly (Fig. 17) and dies early (abortion) or later,\* or it is malformed, or it cannot pass through the true pelvis during labor or it cannot pass in cephalic presentation, but presents by the breech or obliquely. At times the pressure of the advancing child enucleates a cervical myoma which obstructs the passage, the mucosa being torn and the tumor thus delivered (Fig. 96). The blocking of the passage through the true pelvis shows that the cervical myomata are the most dangerous.

Secondary consequences of the narrowed space are:

1. Retention of fæces and especially of urine, sometimes with rupture of the bladder, analogous to what occurs in retroflexion of the gravid uterus;
2. During labor, prolapsus of foetal extremities or of the funis;
3. Rupture of the uterus, usually the fundus (Fig. 107), contrary to the more frequent ruptures of the lower uterine segment resulting from contracted pelvis, etc., and due to the change in the quality of the tissues rather than to the irregular activity of the uterine muscle;
4. Injuries of the soft parts and the bones of the child's skull.

In the third stage interference with contraction causes hemorrhages or retention of placenta. An important consequence of the narrowed space is the frequent occurrence of placenta previa or of tubal pregnancy.

\* In abortion, which is often habitual, not the least part is played by inflammatory proliferation of the mucous membrane commonly present over the tumors.



Second, the tumors cause harm by inducing degenerative changes in the uterine tissue. The fibrous elements proliferate\* rapidly and become partly œdematous, partly myxoid or colloid. There result increased liability to infection, increased friability, increased danger of hemorrhage, and feeble contractions. The tumors are easily bruised and slough.

The dangers of parturition, therefore, are represented by long-continued pains, with secondary feeble contractions, ruptures of the uterus, displacements of the parturient canal, faulty presentation or position of the child, faulty implantation of the placenta, atonic hemorrhages, and prolapse of extremities or of the funis.

The diagnosis of pregnancy complicated by fibromyoma is usually very difficult and cannot be stated schematically. The treatment likewise is to be determined in every case approximately according to the following general principles:

The seat and size of the tumor decide. Small corporeal myomata are left intact. Large polypoid tumors are removed by cœliotomy, with preservation of the ovum. Tumors with broad base or such as are seated in the wall, if large, call for removal of the gravid uterus at the latest possible period in order to save the child.

If the tumor occludes the true pelvis, reposition must invariably be attempted; if the tumor fills one-third of the pelvis and cannot be replaced or removed,

\* According to the most recent investigations by Cornil (Bull. de l'Acad. de Méd., 1893, 6) it is the muscular elements, at least of the intramural myomata, which participate chiefly in the proliferation (see my abstract in the Centralbl. f. Gyn., 1893).

craniotomy is performed in head presentations and extraction in pelvic presentations; if the tumor fills half the pelvis Cæsarean section is indicated, or, if a pedicle can be formed, the Porro operation, or enucleation of the tumor, provided it has not been bruised by attempts at delivery.\*

### § 38. CARCINOMA OF THE UTERUS.

(Fig. 106.)

Carcinoma of the uterus as a complication of pregnancy is rare and bodes ill for mother and child. The disease progresses rapidly. The sequelæ are:

1. The tumor, being rigid, prevents the passage of the child altogether or delays it. At the same time lacerations are produced which may extend into the bladder, and finally mutilation of the ovum may become necessary. The rigid tissue may prevent the contraction of the veins and thus cause air embolism at the ulcerated points.

2. The tissue change causes hemorrhages and the expulsion of friable masses; cancer which extends high up produces abortion or premature delivery by secondary morbid alterations in the placental or foetal tissue.† Moreover, the changes in the uterine tissue give rise to feeble contractions and after-hemorrhages, and finally lacerations are liable to occur in the ulcerated and softened parts, especially in the cervix (Fig. 106) or the vaginal fornix.

\* See my "Atlas of Gynecology" for further observations on the puerperium and for the subjects treated of in the preceding and the following paragraphs.

† Apoplexy in the decidua and chorion.



In immature and premature labors pelvic presentations are frequent.

The diagnosis from sloughing decidua after abortion, from sloughing myoma, and condyloma of the vaginal fornix is made by the microscopical examination of particles removed.\*

The treatment is identical with that appropriate to the condition of the mother; therefore we may combine: (*a*) induction of premature labor, immediately followed by vaginal extirpation; (*b*) Cæsarean section together with Freund's extirpation.

Otherwise, when called to a case in which labor is in progress, the obstructions must be removed by excision of one lip of the os, or incisions when both are implicated, followed by forceps after sufficient dilatation has been secured. If the cervix remains rigid, Cæsarean section is the only alternative.

### § 39. OBSTRUCTIONS TO LABOR IN THE SOFT PARTS OF THE PARTURIENT CANAL.

(Figs. 96, 99.)

These obstructions are rarely serious in their nature. They consist of fibrous, myomatous, and cystic tumors of the vagina. Their effect is similar to the cervical myoma whose expulsion is represented in Fig. 96. To the same class belong subcutaneous hæmatomata of the vagina and vulva which in one-third of all cases arise during labor as a consequence of the great friability of the venous plexuses and the increased intra-abdominal pressure. In twin labors they form at times a very grave complication.

Other encroachments on the canal are formed by

\* See epithelial papillary tumors in my "Atlas of Gynecology."

marked cystoceles when the vagina is inverted. They become particularly dangerous when a vesical calculus is enclosed in the cystocele. In the latter case lithotomy must be performed immediately; in simple cystocele the evacuation of the bladder should not be delayed, and the concavity of the catheter must be directed downward, corresponding to the urethra, which is bent backward.

Still another class of impediments may be formed by the remains of the septum when the canal is double (Fig. 99) and by inflammatory adhesions \* or acquired atresiae or rigidities of the cervix, vagina, hymen, or vulva (nymphæ; compare § 59). In these cases deep lacerations may result, which may extend into neighboring organs, or parts such as the vaginal cervix may be torn off, so that perforation and Cæsarean section may be called for. (See the preceding section.)

#### § 40. OVARIAN TUMORS.

(Figs. 88, 97.)

Like fibro-myomata and malignant tumors of the uterus, ovarian tumors predispose to sterility, and they likewise rapidly increase in size, as a rule, during pregnancy. When the tumor fills the pelvic inlet the cervix is crowded out beyond the vulva (Fig. 88) or more rarely abortion† results. As a rule, how-

\* See "Atlas of Gynecology" under Agglutination of the cervix; Stenoses and acute acquired vaginal atresiae, *e.g.*, by caustics. A similar case occurred in 1892-93 in the Munich gynecological clinic; nitric acid had been used as an abortifacient; operative dilatation several days before labor, followed by perforation of the child. Cicatricial stenosis.

† Expulsion occurs either by mechanical contraction of space,

ever, the ovum, even if it is situated partly beneath, partly behind the cystoma (as in Fig. 97 with uterine fibro-myomata), will develop vigorously. When the foetus is thus situated the diagnosis of pregnancy may be difficult if the great extent of the tumor renders mapping out and auscultation impossible. Otherwise it is not difficult to demonstrate fluctuation, the pedicle of the uneven tumor, and the mobility of the latter alongside the enlarged uterus.\*

*Treatment.*—Operation (ovariotomy) is indicated during pregnancy on account of the danger of rupture of the tumor or of torsion of the pedicle followed by hemorrhage into the interior of the cyst, and because these accidents may occur both during pregnancy or at the time of labor. Still spontaneous reposition of the cystoma or flattening without rupture is possible.

Exceptionally (in the last month) the tumor may be merely tapped or, when the tumor cannot be replaced by reason of firm adhesions or in the case of the more solid ovarian tumors which cannot be tapped, the pregnancy may be artificially interrupted.

During labor, attempts at reposition may be made, tapping performed, or, if still possible, vaginal ovariectomy; otherwise Cæsarean section.

or indirectly by death of the foetus from the same cause or from dragging upon the uterus and the induction of contractions.

\* See also "Atlas of Gynecology."

## CHAPTER III.

## § 41. THE INFLUENCE OF DEVELOPMENTAL ANOMALIES OF THE UTERUS UPON PREGNANCY AND LABOR.

(Figs. 99, 100.)

A unicorn uterus is particularly liable to rupture in consequence of the extreme thinning of the walls. The diagnosis can hardly be made with certainty; even when a rudimentary second cornu is present, only a vaginal septum suggests the possibility of a double uterus. Pregnancy may occur in a rudimentary cornu and will be indistinguishable from an extra-uterine pregnancy, besides presenting the same dangers.

The conditions are different in uterus bicornis. The more complete the division of Müller's ducts the greater becomes the independent function of the parts; thus in uterus bicornis there is individual contractile power so that in pregnancy of the two horns the ova may be expelled at long intervals.\*

The muscular coat of a uterus bicornis is strongly developed, hence the foetus is generally carried to term. The non-impregnated portion participates in the formation of the decidua and in the thickening of the muscular tunic (Fig. 99). The farther the separation extends the less is this participation.

When the horns are fully separated the position of the foetus is vertical and cephalic presentations are the rule; with a common uterine cavity pelvic pre-

\* In the case of uterus didelphys, *i.e.*, the development of two completely separate halves of the uterus, and even in uterus septus, menstruation of one uterus (hence with continued ovulation) occurs regularly along with pregnancy of the other.

sentations multiply; in the case of uterus introrsum arcuatus (Fig. 100), owing to the widening of the body of the organ, oblique presentations are frequent, although it must be admitted that this may be due in part to the shortening of the straight pelvic diameter which is apt to be associated with this anomaly of development. Placenta previa is often met with.

*Labor.*—The faulty inclination of the axis of the gravid horn of the uterus would *a priori* lead one to expect an expulsion of the child in an oblique direction so that the opposite pelvic wall (Fig. 99) opposes great resistance; this, owing to the unequal development of the muscular tunic and the frequent displacement of the non-gravid horn, may cause rupture of the lower uterine segment or excessively delayed labor (missed labor). The same effect may be produced by a tough septum in the vagina. Profuse hemorrhages occur when the placenta is inserted at the relatively non-contractile uterine septum.

Another obstruction to labor may be encountered by the head in the shape of the vesico-rectal ligament, which not rarely persists as a residue of the amnioplastic cause of the arrested development.

*Diagnosis.*—The gravid uterus bicornis can be recognized with difficulty. The slighter grades of this anomaly are more easily perceived than the more pronounced forms, because in the former the whole common part is occupied by the ovum, and the two horns consequently can be made out to be attached above (Fig. 99); in the more marked degrees, however, the ovum is situated in one side; the other is hypertrophied but slightly and cannot be readily palpated (Fig. 100).

## PART IV.

### § 42. RUPTURE OF THE UTERUS DURING PREGNANCY AND LABOR.

(Figs. 102-107, 140, 100, 98, 69-71.)

Rupture during pregnancy, especially when associated with symptoms of profound infection, justifies the suspicion of attempts at criminal abortion. Very often what are obviously ruptured rudimentary uterine horns or tubal sacs are mistaken for ruptures of normal uteri. Spontaneous ruptures occur in the cicatrices of Cæsarean section.

During labor we must distinguish—etiologically, (A) ruptures, (B) erosions; according to the effect produced, (*a*) incomplete, (*b*) complete or perforating (with or without total escape of the ovum into the abdominal cavity); according to the site, (1) ruptures of the fundus, (2) transverse ruptures up to total separation of the body of the uterus from the vagina, (3) simple cervical lacerations, (4) lacerations extending into the vaginal fornix, which are especially dangerous on account of the infection.

The physiological parturient uterus consists of the contracting muscular tunic of the body which ends with the ring of contraction, and of the lower uterine segment which is stretched by this traction and embraces the lower portion of the corpus uteri (as far as

the upward reflection of the anterior peritoneal attachment) with the cervix (see § 8). The uterus finds its inferior counter-stay in the firm connective-tissue radiations (described in §§ 8 and 15) of the lower cervix and vaginal fornix and in the retractor muscles of the uterus. The resistance is formed by the advancing body of the child in its passage through the pelvic inlet and the completely dilated external os. The extent of the ruptures thus caused, I have described in § 8 and illustrated in Figs. 102-107 from original preparations. The excessive stretching by traction is complicated by the pressure of the walls against the on-crowding head. For this reason ruptures occur with hydrocephalus in the absence of pelvic contractions (Fig. 140) and, especially, in oblique presentations (see Fig. 100). The ring of contraction retracts over the head as far as the umbilicus, with great tension and thinning of the lower uterine segment; the trunk of the child is pressed into the latter which begins to bulge forward. At this point the dangerous moment arrives. The contracted fundus is fixed by the tensely stretched round ligaments. When the head cannot be forced into the true pelvis by the abdominal pressure it becomes dangerous by the force it exerts through the child's body upon the lower uterine wall, which already has much to bear. This pressure stimulates the local nerve centres (§ 14) and thereby in a reflex way excites renewed pains and abdominal pressure. The foetal-axis pressure described in § 11 determines at the same time the location of the rupture. This pressure is augmented by the introduction of the hand (violent rupture). Lateral ruptures are therefore the most frequent.



Ruptures begin as subperitoneal hæmatomata by the separation of the muscular fibres; thereby the peritoneum may be detached for a considerable distance without the occurrence of a complete rupture or one perforating into the abdominal cavity (Fig. 98).

Ruptures of the anterior or posterior wall are more rare; but according to my collection of one hundred and one complete ruptures, when associated with total escape of the child into the abdominal cavity they seem to be most frequent. Ruptures of the fundus,\* extremely rare though they are, have been observed, as in the case cited by Simpson; fatty degeneration of the muscles is stated to have been present, but the case did not come under observation until the third day of the puerperium. The escape may occur with membranes intact—particularly often in the case of a yielding cicatrix from a Cæsarean section—or more frequently with evacuation of the liquor amnii into the abdominal cavity, which it seems is not likely to cause infection. The most pernicious are transverse ruptures and those opening the vaginal fornix.

In the diagnosis the factor of beginning extreme distention of the lower uterine segment is of paramount importance. The ring of contraction is high, *i.e.*, from a hand's breadth above the symphysis up to the umbilicus; the head does not enter the true pelvis; the lower uterine segment bulges forward the abdominal walls, like an overfilled bladder; it is tense, as are the round ligaments. The fundus is very small,

\* In Fig. 107 such a preparation from the Munich Gynecological Clinic is presented. Unfortunately no data are given. Was it a cicatrix of a Cæsarean section? The rupture corresponded strictly to the fundus alone.



hard, and empty. The pains follow each other in rapid succession; pulse and respiration are hurried.

If collapse then follows suddenly, together with cessation of the pains and escape of blood from the vagina, rupture has taken place. The diagnosis, therefore, can be made from without; it is not necessary to introduce the hand for exploration, which can but give the patient pain and increase the danger of sepsis.

*Treatment.*—When rupture is imminent, immediate delivery must be effected; unless Cæsarean section is especially indicated it had better be dispensed with, as the proper antiseptic precautions consume too much time; perforation or cranioclasia may be performed, never version.

When rupture has occurred, the child should be extracted *per vias naturales*. If the child has completely escaped into the abdominal cavity the same attempt should be made. In collecting one hundred similar cases my intention was to argue in favor of cœliotomy;\* and I can do so consistently until at least twelve cases of this kind with delivery *per vias naturales* should convince me that it gives better results. In pre-antiseptic times they were certainly worse. By cœliotomy we can control the hemorrhages and suture the uterus as far as may be feasible; but, I am forced to add, its danger consists in the admission of air and in the manipulation of the intestines with the hands, sponges, gauze pads, and their cauterization with antiseptic fluids. All this should be avoided as much as possible. While infection,

\* Münchener med. Wochenschrift, 1889, and Inaugural Dissert., Munich, 1886.

once it has occurred, cannot be removed, we may open a thousand ports of entry for its extension by even the slightest detachment of the epithelial covering. If such lesions be avoided, cœliotomy *per se* acts beneficially as it does in tuberculous peritonitis, as Barbacci\* has recently demonstrated experimentally and bacteriologically.

Another measure which is applicable is drainage of Douglas' pouch combined with compression of the abdomen. The drainage may be effected by means of iodoform gauze, according to Dührssen.

Opening of the vaginal fornix has always terminated fatally under cœliotomy; only one of Leopold's cases recovered after a Porro operation.

Otherwise the percentage of recoveries after cœliotomy ranges from 26 under the most unfavorable, to 100 under the most favorable conditions; that is to say, 26 per cent recovered after protracted labor combined with other attempts at operation or when the vesico-uterine excavation had been opened, 44 to 47 per cent recovered after protracted labor not associated with attempts at operation with escape of liquor amnii.

Compared with the Cæsarean section these results are not bad; and they enforce a distinct warning against violent methods of delivery *per vias naturales*.

### *Erosions.*

As appears in the appendix to § 5 and in § 22, Figs. 69 to 71, the skull of the child presents certain characteristic pressure points which may be the site of hemorrhages, necroses, and infractions. The corre-

\* See abstract in the Centralblatt f. Gyn., 1893.

sponding portions of the cervix become likewise eroded or necrosed by pressure. Points most often injured are over the promontory, the sharp exostoses frequently present in rachitic pelves, the symphysis, and the pecten. As shown in Fig. 105, such defects assume characteristic round funnel-shapes. Usually they close spontaneously, as they are immediately encapsulated by an adhesive peritonitis. There are no special symptoms.

Anterior erosions give rise to uro-genital fistulæ; they result most frequently from necrosis. The plug of dead tissue falls after several days, hence the dribbling of urine is not discovered until the third or fourth day of the puerperium. (For treatment see "Atlas of Gynecology.")

### § 43. LACERATIONS OF THE CERVIX.

Lacerations of the external os are of slight immediate importance aside from the fact that they undergo characteristic ulcerous changes after infection.

The deeper cervical lacerations, which are usually due to the forceps, become important if they extend into the fornix or into the subperitoneal connective tissue, by the fact that they may implicate the branches of the uterine artery (see § 13, Fig. 38). In the diagnosis, therefore, it is necessary to decide whether the hemorrhage is of atonic or traumatic origin. If the uterus feels hard we may, after thorough disinfection, examine with the finger first the vaginal and then the lower and upper cervical mucosa for such lacerations. *Treatment.*—Suture, either according to Veit without speculum by the introduction of two fingers, the uterus being depressed, or else by

the aid of the speculum and Muzeux's tenacula. When no suture material or assistant is at hand, tamponing with iodoform gauze, according to the old method, may be resorted to.

Circular separation of the vaginal cervix (see Fig. 126 in v. Winckel's treatise on Obstetrics, first edition, and A. Martin's Atlas, case of Staude) occurs with rigidity of the external os, with contracted pelvis, incarceration of the lower portion of the cervix and œdema, and from traction with the forceps. The danger of the accident lies not in the hemorrhage but in infection.

For laceration of the vagina and perineum see § 59.

## PART V.

### Abnormal Implantation of the Ovum ; Extra-Uterine Pregnancy and Placenta Previa.

#### § 44. TUBAL PREGNANCY.

(Figs. 108-110, 112, 115, 46, 126, 127.)

Extra-uterine pregnancies are usually tubal, the middle and external portions of the tube being the favorite locations. From the middle portion of the tube the ovisac may extend between the layers of the broad ligament, *i.e.*, it may become intraligamentous. An intraligamentous implantation due to rupture is termed "*grossesse souspéritonéo-pelvienne.*"

When tubo-ovarian cysts are present, the fertilized ovum may become implanted in them, as it may in diverticula of the tube.

When the ovum is attached to the fimbriated extremity a tubo-abdominal pregnancy usually results.

All such ovisacs are to be diagnosticated as pedunculated tumors (Fig. 108).

An ovisac implanted in the isthmus of the tube constitutes an interstitial tubo-uterine pregnancy (Fig. 112); anatomically it is distinguished from so-called tubal pregnancies by the facts that the round ligament is situated laterally to it and that the sac extends into the uterus. Both tubal ostia are occluded.

The tubal ovisac is formed by the peritoneum, the muscular coat of the tube (Fig. 46), the tubal decidua vera and the usually present circumflexa, the foetal chorion and amnion.

The decidua vera is formed from the stroma of the tubal mucosa which proliferates after the cylindrical epithelium is cast off, with the development of large cells; the chorionic villi penetrating into and between the stroma papillæ thus transformed into decidua or into newly formed ridges having a reticulated arrangement. The intervillous circulation of maternal blood is sometimes established in the second month, but there is none of the more intimate intertwining of foetal villi with maternal decidua cones or capillaries in the serotinal zone. In interstitial (tubo-uterine) pregnancy the mucosa-decidua is very thin; therefore the villi evidently penetrate between the muscular bundles and into the capillary veins.

The uterine mucosa is likewise transformed into a decidua of pregnancy by the proliferation of large cells, while the entire organ increases in length and breadth. This uterine decidua is expelled during the second to the fourth month, accompanied by hemorrhages (Figs. 58, 126, 127). The superficial layer is not covered with epithelium, and the lumina of the glands which are likewise devoid of epithelium are contracted to a minimum, but the blood capillaries are wide; in the depth the glandular canals are invested with several layers of epithelium.

The diagnosis in most cases, especially in the early months, is very difficult. The expulsion of the decidua (Figs. 126, 127) is an important diagnostic point and calls for the introduction of the sound into

the uterine cavity which, as stated above, will be found enlarged in every direction but empty. The decidua, on the side which was turned toward the uterine wall, shows between irregular fissures the gland openings; on the other side, which was directed toward the uterine canal, the same openings appear between a more delicate, almost regular, obliquely quadrangular marking resembling a quilt.

Bimanual examination discloses an extra-uterine tumor which is pedunculated when the pregnancy is near the free end of the tube. This tumor is softly elastic (the child then is most probably still alive); if hard nodular particles are felt they consist of the extravasations of blood which take place into the membranes with the death of the foetus, while the liquor amnii diminishes.

If pregnancy is at all suspected, we shall be impressed by the premature elevation of the parts above the symphysis, corroborated as it will be by the foetal heart sounds audible at that point. The subjective symptoms are also increased so that the movements of the foetus are felt painfully during the fifth month. From the fourth to the fifth month the foetal parts can be palpated with special distinctness. Intra-uterine may be associated with extra-uterine pregnancy and there may also be bilateral extra-uterine foetation; several times, too, extra-uterine twin pregnancy has been observed. The diagnosis of rupture of the ovisac is based on the symptoms of internal hemorrhage together with violent pain and shock-like collapse. From the third month on these ruptures are particularly dangerous, as the hemorrhage may be fatal. Behind and alongside of the uterus we



may feel the tense tumor of a retro-uterine hæmatocele.

*Differential Diagnosis.*—The absence of menstruation with, at times, irregular hemorrhages, will serve to prevent confusion with ovarian cysts, subperitoneal fibro-myomata of the uterus, or pelvic abscess (fever). Retroflexion of the gravid uterus (§ 34) is always associated with marked ischuria, which is not present in ectopic pregnancy, and the cervix is displaced forward, with thinning of the anterior lip of the os.

*Etiology.*—The anatomical causes of tubal pregnancy are to be found mainly in the gonorrhœic alteration of the cylindrical epithelium, which swells and loses its vibratile cilia (compare § 16). Besides, owing to the inflammatory proliferation of the papillary stroma, there is formed an irregular close meshwork of excrescences, whose minute, fissure-like interspaces are filled with secretion and partly with desquamated epithelia (see "Atlas of Gynecology"). The interstitial inflammation which penetrates more deeply, by causing connective-tissue proliferation deprives the muscular coat of its contractility and consequently of the power of transporting the ovule.

Among the coarser primary alterations which become active in preventing the passage of the ovule are contractions and flexions of the tube resulting from peritonitis or its residual bands. A similar effect is produced by close twists of the tube—an infantile arrest of development (Freund).

Caseous tuberculosis acts like intense gonorrhœic salpingitis. Uterine polypi in front of the tubal ostium, similar tumors and small myomata within the



tube (salpingitis nodosa of the uterine portion of the tube) may bar the passage. Mental emotions (partly within the sphere of sexual life) and external transmigration of the ovule interfere with the usual course of the impregnated ovum. Generally sterility is an antecedent.

The course may be as follows:

1. The child is carried to term and dies unless it is saved by coelio-salpingotomy.

2. With cramp-like pains the ovum passes through the fimbriated extremity into the abdominal cavity (tubal abortion).

3. The sac ruptures either into the abdominal cavity or between the layers of the broad ligament (see above).

4. In interstitial pregnancy (Fig. 112) the foetus may be propelled into the uterus, etc.

5. The foetus may perish by disease of the placenta: subchorionic extravasations, myxoma, hydramnios; malformations also occur.

When rupture takes place the mother collapses suddenly by reason of the hemorrhage and consequent shock. As a rule, the child dies at once. After early ruptures a retro-uterine hæmatocèle remains (see "Atlas of Gynecology"). The whole of the placenta may be absorbed.

In very rare cases the child lying free in the abdominal cavity has continued to develop. Such cases or tubal abortions cause secondary abdominal pregnancy.

## § 45. ABDOMINAL PREGNANCY.

(Figs. 113, 115.)

If primary the course is the same as in the secondary form mentioned in the preceding paragraph. That the primary form does occur has been proved beyond question by Schlechtendahl's case (encapsulation of the ovisac in the region of the spleen) among others, although many of the cases, even those diagnosed anatomically as abdominal pregnancy, took their primary development from the fimbrio-tubal epithelium or were nothing but tubal sacs.

The peritoneum furnishes the decidua—usually from the posterior surface of the uterus—and fibrinous membranes strengthen the wall of the sac up to a thickness of 1 to 1½ cm. Muscular fibres also extend into it from the subserous tissue; even striated fibres have been found. In this connection I may state that similar fibres have been demonstrated also in the uterus at the placental site, in ordinary intra-uterine pregnancy. In all extra-uterine pregnancies the thickness of the wall and hence the possibility of rupture depend upon the muscular tunic. Often the ovum lacks every maternal envelope over a considerable extent of the circumference; the circumflexa seems to be formed occasionally.

As to diagnosis reference may be made to tubal pregnancy.

The course is manifold:

1. The child lives until mature, then pains set in.
2. Premature pains, separation of the placenta, hemorrhages into the latter; death of the child.

3. The dead foetus undergoes the same changes as in tubal and ovarian pregnancy, that is to say, it is

(A) Absorbed—the more septic germs take part the more rapidly—the liquor amnii is absorbed as are the tissue juices, the ovum adheres to the membranes; organization takes place by the penetration of granulation tissue as far as the bones;

(B) Expelled, with or without absorption, by ulceration into the bladder, rectum (Fig. 115), vagina, or thorough the anterior abdominal wall, under the influence of germs from the tube;

(C) Calcified (usually in the absence of septic germs) by way of the peritoneal membranes, in one of the following forms:

(a) Calcification of the membranes (*lithokelyphos*), the child remaining fresh within the calcareous envelope;\*

(b) Calcification involves also the adjoining surface of the child (*lithokelypædion*);†

(c) Impregnation of the entire child with lime salts (*lithopædion*) in the absence of the membranes; the internal organs, however, participate but slightly in the process and undergoing fatty metamorphosis they are changed into a lime soap resembling spermaceti;‡

(D) Reduced to a skeleton.

\* For instance, the cases reported by Virchow, Küchenmeister, the lithopædia at London and Langensalza.

† For instance the lithopædia at Leinzell and Pont-à-Mousson.

‡ For instance, the lithopædia at Heidelberg, Lübben, and Toulouse.

## § 46. OVARIAN PREGNANCY.

This occurs most rarely; fructification takes place:

Within the follicle, the rupture (Fig. 47) being too small to permit the ovum to escape. The chorion penetrates into the surrounding ovarian stroma; the formation of the decidua starts from the zona granulosa of the Graafian follicle, supported by the ovarian stroma. The ovarian ligament forms the pedicle of the tumor;

Or primarily in the follicle, but subsequently developing outward into the abdomen as an ovario-abdominal pregnancy, embedded in masses of fibrin;

Or as a tubo-ovarian pregnancy, when a congenital or acquired (by perisalpingitis and flexion) ovarian tube was present (see § 16);

Or in a tubo-ovarian cyst; one of the cysts of an ovary in partial cystoid degeneration bursting into the tube and causing hydrosalpinx.

Ovarian pregnancy has been observed a few times in an inguinal ovarian hernia.

In extremely rare instances the child may be carried to maturity in this locality.

*Treatment of Extra-Uterine Pregnancy.*

Early rupture of the sac in the first two months, with absorption of the ovum and early mummification or calcification when the foetus is too large for absorption, are the most favorable issues (still twenty-five per cent terminate fatally). Later the hemorrhages may endanger life, and the foetus being large is more liable to putrefy.

The treatment still embraces several mooted ques-

tions. The most ideal mode—expectancy, allowing the child to reach maturity, and then saving both mother and child—is too risky in view of what has been said above and of the more recent methods of operation. The indications at present are about as follows:

1. In the first three months (perhaps also including the fourth and fifth), injection of one-half grain of morphine into the sac, without aspiration of the liquor amnii and under strict antiseptic precautions (one injection per week). [Laparotomy as soon as the condition is recognized, either before or after rupture, should be the rule in every case where the surgeon is competent and the environment such as will allow operation.—ED.]

2. In advanced extra-uterine pregnancy, waiting until the foetus has died, the patient being kept in bed; some time afterward the dead foetus removed by coeliotomy.

3. When rupture has taken place and the collapse is not extreme coeliotomy may be performed; when the symptoms of hemorrhage and the shock are too violent; absolute rest and opiates; the foetus to be removed later on.

### § 47. PLACENTA PREVIA.

(Figs. 28, 52, 133–135, 96, 142, 119.)

Placenta previa results when the ovum is implanted in a faulty manner within the uterus so that the serotina is inserted primarily in the lower uterine segment (§ 8, Figs. 28, 52). This segment, however, is considerably stretched even during pregnancy by uterine contractions and especially during labor.

This stretching detaches the placenta. Placenta previa centralis is the condition (Fig. 134) when the placenta covers the entire internal os; placenta marginalis, when only its edge extends to it (Figs. 133, 135). The separation of the placenta causes hemorrhages which usually begin in the seventh month with placenta previa centralis, in the eighth month with placenta previa lateralis, and in the ninth month with placenta previa marginalis. The hemorrhages are of diagnostic importance and result from injuries to the utero-placental vessels, or, more rarely, to the fœtal vessels within the chorionic villi. Sometimes the placenta is lacerated; if this occurs during early pregnancy the placenta previa centralis changes into a placenta succenturiata (Fig. 134). If a lobe is torn off during pregnancy, a placenta previa centralis will be changed to a placenta previa lateralis.

The hemorrhages which may occur in the first half of pregnancy are to be explained partly by the uterine contractions, partly by the separation of villi from the thin lower uterine segment, especially when the placenta covers a large surface.

The placenta owes its faulty implantation *ab initio* to several causes:

(a) The cavity of the body of the uterus may be unsuitable for the insertion of the ovum. This is the case with fibro-myomata (Fig. 96), faulty shape and position of the uterus (uterus unicornis, bicornis, deep insertion of the tubes, subinvolution with excessive width of the cavity resulting from it). The subinvolution may be due to too early getting up of poor puerperæ or to repeated pregnancies in rapid succession with general relaxation of the uterine wall; a

special predisposition exists in old primiparæ in the first or second pregnancy. It is the case furthermore when the uterine cavity is too wide after chronic catarrhs (metritis), since the ovule besides is liable to be carried farther down by the secretion, or, on the other hand, because the formation of the decidua by the diseased corporeal mucosa remains incomplete.

(b) The lower uterine segment itself may be apt to permit the low insertion near the internal os. This is the case after loss of the epithelium, whose cilia create an upward current, the loss being caused by endometritis; also in epithelioma of the cervix, because, as in endometritis, secretion prevents the coalescence of the decidua circumflexa, the latter becomes especially vascular near the transition fold where the chorionic villi persist; and in old cervical lacerations.

(c) The surface of the serotina may be abnormally large, for which reason twin placenta are particularly predisposed.

Stress must be laid on the frequent occurrence of velamentous insertion (Fig. 135), placenta succenturiata (Fig. 134), and placental infarctions (Fig. 142) in combination with placenta previa. I find the explanation of all these phenomena in the degree of infection of the inflamed endometrium and shall give my reasons in my "Atlas of Embryology" in connection with the histological structure of the physiological endometrium of pregnancy in the first month.

These anatomical findings make it clear why pluriparæ, multiparæ, old primiparæ, and poor women, in whom besides hard work may exert an additional



influence, suffer with special frequency from placenta previa, sometimes in several pregnancies.

Of the purely anatomical findings only a few points may accidentally become of value in the diagnosis, *e.g.*, the low implantation of the placenta may be felt through the abdominal walls, a peculiar doughy and succulent quality of the supravaginal cervix, the impossibility of palpating parts of the foetus from the vagina, etc. A much greater value attaches to the intermittent hemorrhages during pregnancy. In the differential diagnosis it should be borne in mind that such hemorrhages occur also with hydatidiform moles, but in the latter case no foetal parts can be detected nor does the size of the uterus correspond to the time of pregnancy.

*Course.*—The internal os may remain closed until term, *i.e.*, the lower uterine segment does not develop, and no traction acts upon the placenta; there is no hemorrhage during pregnancy.

If the cervix, however, does not remain intact and the supravaginal portion expands together with the internal os, early hemorrhages and changes in the placenta take place. A profuse hemorrhage may cause asphyxia of the child. Or else a small lobe of the placenta is torn off and after parting with its blood becomes atrophic. During labor grave cervical lacerations are apt to occur in the undeveloped portion of the cervix. Operative interference is particularly liable to produce such lacerations.

During labor, too, the escape of blood is augmented between the pains as the lower portions of the placenta are detached by the contractions. The flow of blood is increased by the tearing of foetal vessels



in the case of marginal or velamentous insertion of the funis, which is of frequent occurrence. The umbilical cord often prolapses; the succeeding blood stasis leads to overfilling of the deepest cotyledons and loosens them. The uterine vessels are compressed momentarily by the pains, but these are usually weak for several reasons: partly in consequence of the untimely onset of labor, partly in consequence of the thinness of the muscular coat of the lower uterine segment which is in activity (§ 8), partly on account of the absence of the main stimulus, the descending bag of waters, and lastly in the vicious circle the loss of blood reduces the contractility of the muscles. The patulousness of the vessels greatly increases the danger of the entrance of air into them. The atony of the placental site favors post-partum bleeding. The fact that such hemorrhages cease at all is to be explained by the retrograde arterial supply of the lower uterine segment from the upper thicker muscular layers described in § 8.

Abnormal presentations are frequently caused by the displacement of the head from the lower portion of the uterus. The placenta is occasionally expelled before the child (*prolapsus placentæ*). Retention of membranes is apt to occur.

Hemorrhages determine the treatment: tamponing of the cervix and vagina with iodoform gauze; version of the child when the os is dilated (Braxton Hicks' method), which is to be invariably performed when the entire cervical canal is sufficiently dilated to admit two fingers, but immediate extraction should not follow; tamponing by means of the

leg brought down; restoratives, ergotin, or injection of 0.6-per-cent salt solution, either by transfusion, or subcutaneously, or per rectum; auto-transfusion by enveloping the legs in elastic bandages. For atonic hemorrhages from the empty uterus: ergotin, tamponade of the uterine cavity by Dührssen's method (Fig. 110).

## PART VI.

### Anatomy and Etiology of the Premature Expulsion of the Ovum.

#### § 48. GENERAL DISEASES OF THE MOTHER; SYMPTOMS OF COMMENCING EXPULSION OR ABORTION.

(Figs. 124, 128, 141, 119, 125, 127, 118, 126, 122.)

Subchorionic, *i.e.*, decidual, hemorrhages occur very frequently in general infectious diseases, especially if acute and associated with high temperature, and by interfering with the circulation cause the death of the ovum. These apoplexies (Figs. 124, 128) are found most commonly in the deciduæ, especially the serotina, extending either into the stroma, when the fibres and the large decidua cells are widely separated, or into the cavities of the glands.\* They constitute in the placenta nodules the size of a hazelnut or larger and by encroaching upon the space are alone sufficient to cause malformations of the embryo.

These apoplexies usually give rise to abortion, or, after the placenta serotina is completed, *i.e.*, from and after the sixteenth week, to immature labor. The embryo as a rule is absorbed (the liquor amnii is turbid and brownish, a fragment of the funis and

\* See the illustration in my "Embryological Atlas," in which these processes, so far as they relate to the ovum, are treated in detail.

the umbilical vesicle are still present), or torsion of the funis causes its death and maceration (Figs. 141, 128). The lymphoid transudation (see Fig. 123 for small subamniotic blood and serum cysts) detaches the amnion, and the ovum may be expelled in its own envelopes (chorion and amnion, Fig. 119) or even in the intact amnion alone with its contained liquor amnii (Fig. 125). Expulsion with the maternal decidua, representing as it were a cast of the entire lumen of the corpus uteri in the form of its separated decidua vera, is illustrated in Figs. 118, 126, 127. We see, as has been pointed out in § 10, that the ovum in the first and second months is smaller than the uterine cavity. At and after the end of the fourth month the true placenta serotina is complete and the portion of the chorion adjoining the opposite decidua circumflexa has retrogressed to a smooth membrane. From this time forward the expulsion of intact ova is of rare occurrence. During and after the fifth month the escape of the liquor amnii early in labor is more common. In Fig. 119, an artificially opened three months' ovum, we see the shreds of decidua circumflexa hanging from the chorion and still easily to be distinguished from it. In Fig. 122, a four-months' ovum, the placenta serotina is fully developed, the retrograded chorion is torn and has coalesced with the decidua circumflexa, and the amnion is likewise seen.

Deciduae containing interstitial apoplexies, which have been retained and subsequently expelled alone, are called blood moles. If the decidua is retained still longer the hemorrhages continue and the fibrous deposits in the residues of the membranes

thicken them until the lumen of the uterus is filled. This process occurs also with retained portions of placenta from older ova and mature foetuses; the organic consequence of such a retention is a placental polypus (Fig. 130).

The mode of detachment of an abortive ovum corresponds to that of the mature placenta (see Fig. 128). The retroplacental hæmatoma severs the central portions of the serotina and thus the ovum *in situ* is forced out of the uterus. When the membranes rupture, the foetus of course is expelled first and the loose membranes are inverted over the more voluminous serotina toward the fundus; the foetal surface of the ovisac advances.

Duncan's mode of detachment may also be observed in abortive ova. When the ovum is implanted near the internal os, the development, instead of being downward, must extend upward so as to fill the cavity of the fundus. Under these circumstances the retroplacental hæmatoma forms not centrally but so as to detach the serotina at its margin.

When the foetus is retained in the uterus it becomes macerated; the next stage of retention is that of resorption—the foetus, all of whose limbs are distorted, becomes mummified, and sloughing follows when infection is admitted. In this way the ovum may be carried beyond the physiological term of pregnancy (missed abortion).

(The lithopædia found in the uterus are probably merely transferred, *i.e.*, they originate in extra-uterine gestation or its equivalent, pregnancy in a unicorn uterus.)

According to the above anatomical data the points

of diagnostic importance in beginning abortion are hemorrhages, an enlarged soft uterus, with a closed external os.

This condition calls for expectant treatment—rest in bed, opiates per enema, cold vaginal irrigations, and external applications.

In advanced abortion part of the ovum is felt to be detached. In that event, whether the hemorrhage is profuse (as usual) or slight, removal of the ovum is indicated: iodoform gauze tamponade of the cervix and vagina, ergot or ergotin.

When the ovum has already been expelled, the cervix is patulous and the body of the uterus is as a rule hard, having contracted under violent pains. Digital exploration shows a rough internal surface with clots and shreds of membrane, which under the microscope will be found to consist of villi and portions of decidua (Figs. 58, 59).

When portions of the membranes have been retained the hemorrhages continue, mixed with brownish detritus which finally becomes fetid. Under such circumstances, in a recent case with profuse hemorrhage, the uterine contents should be expressed bimanually, preceded if necessary by rapid dilatation. This failing, the interior of the uterus must be cleared by means of the finger or the curette, proper care being exercised.

The sequelæ remaining after abortion depend, like the abortion, upon the antecedent causes, such as inflammatory conditions of the maternal and foetal membranes, acute constitutional (syphilis) and infectious diseases which produce their local effects in various ways, great physical and mental excitement, displace-

ments and tumors of the different parts of the genital tract.

Accordingly the consequences are the continuance of states of engorgement and of chronic inflammations—catarrhal hypersecretion, menorrhagia, and displacements of the uterus, partly by flexion of the subinvolted wall, partly by adhesions. One abortion predisposes to another; a succeeding pregnancy, therefore, requires prophylactic treatment.

Consequences disastrous to the ovum are produced by eclampsia and syphilis; the latter will be discussed in § 50.

Whether or not eclampsia is an infectious disease is still an open question. That it is due to a specific source of infection has not been proved nor is it probable. It is much more probably the result of the combined effects of compression of the ureters by the foetal head after its passage into the true pelvis, and secondary interference with renal secretion, with resulting retention in the circulation of various micro-organisms and especially their toxins or ptomains, which again exert their influence in producing abnormal, partly poisonous products of metabolism of the different organs. The acetone and sugar demonstrated in the urine by Stumpf may have this origin, as may the amyloid and fatty degeneration of the kidneys, liver, brain, etc., with thrombosis and apoplexies or with oedema and anæmia in the same organs. Acetonuria, for example, may be produced experimentally by inhibiting the coeliac sympathetic ganglion.\*

At all events compression of the ureters plays an important part in its production. A predisposition

\* See article on eclampsia in the *Centralbl. f. Gyn.*, 1892, 39.



exists in primiparæ in whom the head descends early, in twin and triple pregnancy, in generally contracted pelves (but not in the flat contracted pelvis, because the deeply excavated "dead space" adjoining the projecting promontory protects the ureters), etc. It is hardly likely that there is only a single cause.

The symptoms consist in spasmodic attacks, mainly in the form of clonic convulsions; they are usually preceded by intense headache with weakness and stupor deepening into unconsciousness. The face becomes cyanotic, the pulse small and rapid, respiration sometimes hurried, sometimes gasping and blowing, with hiccough. The convulsions involve also the muscles of the face and eyes.

The attack, which lasts from one-half to one and a half minutes, is followed by a comatose condition with rising temperature.

The urine contains albumin, fibrinous casts, red and white blood corpuscles, sugar, and acetone; it is greatly diminished in quantity and its acidity is increased.

The prodromata and sequelæ include headache with nausea and vertigo, symptoms of amblyopia and amaurosis, maniacal conditions preceded by peevishness, alternating with laughter, talkativeness, etc.

The foetus often dies during pregnancy or labor, usually early. Delivery may not follow the death, yet after its occurrence the attacks cease. Children in a state of rigor mortis have been extracted, possibly as a consequence of the opiates given. For the detailed histogenesis of the microscopic appearances in tissue changes of the placenta, the so-called placental infarctions, which, however, are by no means



constantly found after eclampsia (Figs. 120, 142, the reader is referred to the explanation of the figures).

The treatment consists in the hypodermic administration of morphine in doses up to one-half grain in each attack (G. Veit has given as much as three grains in from four to seven hours), or in inducing chloroform anæsthesia. [In cases in which the arterial tension is high the safest and most efficient measure is the employment of tincture of veratrum viride hypodermically in doses of from 6 to 10  $\mu$  every hour until the pulse becomes soft, and later as may be needed. Alcohol in any form is a physiological antidote to the veratrum.—ED.]

#### § 49. DISEASES OF THE ENDOMETRIUM AND OF THE FETAL MEMBRANES.

(Figs. 121, 129, 130, 141, 92, 124, 123, 131, 132, 120, 128.)

It is impossible in this place to give the detailed anatomy or histology of the diseased endometrium during pregnancy and those of the membranes so intimately connected with it histogenetically, without a previous discussion of the physiological development of the decidua and chorion and their relation to each other; I therefore must refer the reader to my "Atlas of Embryology." In this connection I shall deal only with the clinical symptoms and refer to the brief descriptions accompanying the microscopic drawings in the present work.

Gynecologically we distinguish two varieties of inflammation of the uterine mucosa—that of the glandular portion and that of the connective-tissue portion, under the names, respectively, of glandular and

interstitial endometritis. Inflammations have a deleterious effect upon the implantation of the ovum, as has been explained under the head of placenta previa and in the preceding paragraph in connection with acute alterations, apoplexies, etc., due to infectious general diseases. The local varieties of endometritis do not improve during pregnancy but produce special effects upon the ovum.

Catarrhal endometritis of the decidua vera manifests itself symptomatically as hydrorrhœa of the gravid uterus (Fig. 121).

The hypersecretion of the hypertrophic and hyperplastic glands detaches the decidua circumflexa from the vera, and the secretion (which may exceed 100 gm. at each evacuation) is expelled from the external os by labor-like contractions of the uterus. It differs from the liquor amnii by not being followed by abortion and by being free from vernix caseosa or lanugo. It differs from urine by containing only minute quantities of urea, by its neutral or alkaline reaction, and by coming demonstrably direct from the uterus. It differs from the secretion of simple cervical endometritis and colpitis in that the latter occurs only in extremely small amounts and contains pus and fungi, while the secretion of hydrorrhœa of the gravid uterus is watery and glairy (very rarely containing some blood or pus when associated with cervical endometritis), free from albumin, strongly impregnated with sodium chloride, mixed with epithelia, and has a specific gravity of 1.003.

The secretion accumulates between the two deciduæ, or, when the membranes are pervious to liquor amnii, also between the decidua circumflexa and the

chorion, or between the latter and the amnion. When the secretion remains in the gland spaces, cystic decidual endometritis arises (see Fig. 121).

When the inflammatory condition of the mucosa leads to anatomical alterations, the proliferative processes of decidua polyposa ensue. The stroma and the cellular portion proliferate uniformly so that polypoid excrescences develop, which consist of fibrous tissue enclosing large decidua cells, and produce circulatory disturbances, engorgement in the dilated isolated vessels and the cavernous vascular network (Fig. 121). Furthermore, numerous apoplexies arise which finally seem to constitute the whole of the polypoid excrescences.

On the other hand a defective formation of the decidua vera, an atrophy, may occur; the cell proliferation failing to take place, and the new-formed cells undergoing fatty degeneration. The atrophic decidua is free from irregularities.

A cause of abortion starting from the chorion is multiple myxoma of the chorion, which leads to the formation of the hydatidiform or vesicular mole (Fig. 129). Abortion occurs as a rule; rarely the mole remains in the uterine wall and penetrates into it in the form of a destructive myxoma (Fig. 130), directly as far as the pampiniform plexus, metastatically it has been found in the lungs in the form of emboli.

The etiological factors include local inflammations of the uterine mucosa, perhaps also general infectious diseases of the mother or of the ovum (derived from the father), tuberculosis, syphilis, and frequent impregnation.

*Treatment.*—Stimulation of uterine contractions;

when hemorrhages occur, dilatation of the cervix, evacuation of the uterus.

As myxoma may affect only a portion of the placenta, so it may later induce general or circumscribed gelatinous hyperplasia of the funis; the latter in the gelatino-œdematous hydatidiform variety (both combined in Fig. 129). At times in this condition the increase of liquor amnii may cause polyhydramnion (also illustrated in Fig. 129). The occurrence of the latter *per se* has also been observed, mainly in pluriparæ and multiparæ, but otherwise it is by no means uniformly associated with definite symptoms of the mother, of the placenta, or of the child, although it may appear in combination with them.

Most frequently diseases of the foetus proceed *pari passu* with polyhydramnion—foetal œdemas such as ascites and anasarca in syphilis and hydrocephalus; the formations of fissures with transudation in consequence of congestions which lead either to hypersecretion of the kidneys or to a damming back in the umbilical vein and transudation through the amniotic lacunar system into the amniotic sac. For the same reason it may occur also in velamentous insertion. Finally polyhydramnion may be caused by foetal inflammatory processes (syphilis undoubtedly in some cases); directly as an inflammatory exudation, indirectly as a congestive transudation in consequence of cirrhosis of the liver, phlebitis, etc. The funis is very liable to prolapse.

In the case of twins an irregular division of the placenta may cause unequal nutrition and varying resistance to the current—polyhydramnion and oligohydramnion (Fig. 141).

In the diagnosis the markedly spherical form of the uterus, together with considerable distention of the abdomen (Fig. 92), at the fifth month of pregnancy, may point to the condition; the foetal parts are barely palpable.

*Treatment.*—When the symptoms are very pronounced and dyspnoea occurs, the induction of premature labor by puncture of the membranes is indicated.

Inflammations which affect all parts of the placenta may occur in a diffuse or circumscribed form. This placentitis originates from infectious germs, obviously variable in their nature, whose influence is gradually progressive. Syphilis undoubtedly plays a prominent part in this process, though it is difficult to demonstrate; eclampsia has been discussed above. This is the mode of origin of the placental infarctions (Figs. 120, 141), likewise mentioned before; of the so-called subamniotic “fibrin” (also necrotic but flat foci, Fig. 123), often associated with subamniotic serum and blood cysts. The specific syphilitic diseases cause inflammatory proliferation of the villous stroma and the epithelium, and give rise to thickening of the vascular walls in the villi as well as in the funis (Figs. 131, 132) and to their final obliteration.

All these diseases interfere with the blood respiration of the foetus, whether by necrotic exclusion of entire segments of the placenta, or by intervillous thrombosis of maternal blood spaces, or by diminution of the foetal-placental circulation. These conditions again induce more active movements of the foetus, which in turn give rise to torsions of the funis (Figs. 128, 141) that are twisted more closely near the

umbilicus, coiling of the funis around the child, and the formation of knots, all of which hinder the foetal circulation of the blood.

§ 50. DISEASES AND MALFORMATIONS OF THE FŒTUS  
AS CAUSES OF DISTURBANCES DURING PREGNANCY  
AND LABOR.

(Figs. 140, 136, 139, 141.)

Gravid women are much predisposed to syphilitic infection; if this occurs within the first four months it entails abortion; after that time until four weeks before term immature or premature labor is rare, but infection of the child is frequent. The symptoms at times are slight—impaired nutrition and marasmus in the first year of life; but in many cases they include the characteristic bullous eruption (pemphigus) on the palms and soles, dropsy of peripheral parts and the skin, often ascites and hydrothorax, hydrocephalus unquestionably in some instances, osteochondritis at the juncture of epiphyses and diaphyses, especially of the tibia and femur, enlargement of the liver and spleen by connective-tissue proliferations, gastric ulcers (melæna\*), interstitial pneumonia (asphyxia), etc.

The syphilitic virus, therefore, may pass from the mother to the placenta and foetus, and the ovum may have become infected at the impure cohabitation, the germ may even extend from the infected foetus to the previously healthy mother.

Internal hydrocephalus consists in dropsy of the

\* See v. Winckel: "Berichte und Studien," 1884-90, results of my autopsies upon melæna, pp. 545-562.



lateral ventricles of the cerebrum. The slighter grades barely alter the fontanelles and sutures, and are therefore diagnosticated with difficulty during labor; in the higher degrees of distention by water up to 5,000 gm. nothing is left of the brain but a thin mantle with very flat gyri and a wide, membranous, flabby skull sac, owing to the wide separation of the sutures and fontanelles. This disease is often associated with fissures and ruptures of the spine and cord, of the diaphragm, of the abdominal walls (umbilical hernia), also with entire absence of one kidney, with bilateral pes varus, with congenital rickets (micromelia), and with other forms of dropsy (ascites for instance) and polyhydramnion. Several hydrocephali have been born by one mother.

During labor pelvic presentations often occur because the lower uterine segment offers less room for the head than the fundus, and the uterine contractions therefore effect this change of position.

It is not easy to make the diagnosis during labor from the data here given. The guiding-points are the width of the fontanelles and sutures, the small triangular face in comparison with the large spherical skull, and the difficulty of the first-coming or after-coming head of passing the pelvic inlet in spite of the normal size of the latter. Usually the whole hand must be introduced for making the diagnosis.

The engagement in the pelvic inlet is the most difficult part of labor (Fig. 140). Under the uterine contractions the head acts like a tensely filled bladder of water and when in the horizontal position it presents the largest circumference, the largest diameter. The more deeply the presenting parietal bone is forced

down the better is the prospect that at least one segment of the sphere will engage (*e.g.*, a lateral half of the skull, or a frontal or anterior parietal presentation). The tension is no longer so uniform and is divided partly above, partly below the pelvic inlet. Thus in twenty-five per cent of all cases spontaneous delivery may take place, although the angular bones of the foremost segment are apt to lacerate the swollen cervix.

As a rule puncture of the skull is required because the excessive stretching of the lower uterine segment may cause rupture.

An enlargement of the head may also be caused by the formation of fissures and herniæ of the skull (frontal, superior, and posterior meningocele, epignathus). These all cause less difficulty than a large hydrocephalus, because the hernial sacs are yielding and the heads are usually small. More serious in their nature are normally large hard heads and broad shoulders, especially in old primiparæ. In such cases it is necessary to try in turn forceps, version and extraction with after-coming head, perforation, and ultimately decapitation. Hemicephal and anencephali usually present by the face (Fig. 136).

The trunk may be enlarged by hernial sacs, by rhachischisis and omphaloceles (hernia funiculi umbilicalis, ectopia viscerum), by tumors (coccygeal teratoma), and by dropsical accumulations (ascites, distention of the bladder, and hydronephrosis in consequence of atresia of the urethra, Fig. 139). The diagnosis is doubtful. Delivery may be effected by version or perforation and incisions, according to indications.



Additional complications are caused by double monsters: in Figs. 137 and 138 is illustrated the engagement of a dicephalus dibrachius and a thoracopagus. The diagnosis can be made only during labor by the manual demonstration of the deformity. Aside from their rarity they constitute but a slight danger, since labor with most monsters is premature or immature.

### *Multiple Pregnancy and Labor.*

From a collection of 13,000,000 labors G. Veit calculated one twin to 88 single deliveries, one triplet to 7,910 single deliveries, one quadruplet to 371,126 single deliveries. Quintuplets have recently been reported about a dozen times in different countries. Multiple pregnancy is due to the discharge of several ovules during a single menstruation or to an ovum with several germs. The latter (uniovular twins, etc.) have common membranes down to the amnion which is separate for each child and are of the same sex; the former have each its own chorion or its own decidua circumflexa and may be of the same or opposite sex.

In the uniovular twins, etc., there occurs an anastomosis of the placental vessels and in these the third circulation develops; if the latter is asymmetrical unequal development of the children will occur, according to Schatz. If one has for its share too small a division of the placenta it perishes and becomes a foetus papyraceus, being flattened by the other (Fig. 141).

The diagnosis of twin pregnancy is assured by (1) feeling more parts of the same name than could be

long to one child (two ovisacs, two heads, more than four extremities); (2) feeling parts so situated that they could not possibly belong to one child; (3) hearing the heart sounds most clearly at far distant points or with unequal frequency; (4) being able to displace one child by the presenting part without the other following.

Delivery occurs as a rule with both in head presentation, but in multiple pregnancies pelvic or faulty presentations occur far more frequently than in single births. In more than two-thirds of all cases labor occurs before term; it is protracted for the first child, accelerated for the rest. The mortality, especially for boys (owing to their size and according to Veit to their slighter vitality), is greater than for single children. The placenta usually follows the last child; atony of the uterus is a frequent sequel (after-hemorrhages; ergot as a prophylactic).

## PART VII.

### § 51. ABNORMAL PRESENTATIONS, POSITIONS, AND ATTITUDES OF THE CHILD.

(See § 13, Figs. 69-71.)

Oblique and transverse presentations are prognostically most unfavorable. Nearly equally unfavorable are faulty cephalic presentations, such as the anterior parietal brow and face presentations with chin posterior.

The transitional forms as to prognosis are formed by face presentations with chin anterior and by pelvic presentations.

As to abnormal head presentations it should be remembered that, as the occiput is always held back, any of the anterior portions of the head from the large fontanelle to the chin descends; this first rotation therefore is inversely analogous to that in the occipital presentations, and the same correspondence applies to the remaining rotations, *i.e.*, the part first descended turns forward, and finally there follows the passage of the broader occiput over the perineum; it is always that prominent portion of the head adjoining the first descended part which is arrested by the symphysis, in other words:

	Descended.	Arrested.
Occipital presentation, with small fontanelle, nucha.		
Anterior parietal presentation,	with large fontanelle, forehead.	
Brow presentation,	with forehead,	superior maxilla.
Face presentation,	with chin,	neck.

It is evident from § 13 that in all these cases a larger cephalic periphery than in occipital presentation passes through the pelvis and the broader occiput over the perineum. Under such circumstances, as stated before, Kaltenbach's mechanism, *i.e.*, the influence of the spinal column which in occipital presentations is especially yielding and movable, is rendered inactive; a plainly insuperable obstacle is formed by the extremely extended spinal column in unfavorable face presentation with chin posterior. The consequences are premature rupture of the membranes, death of the child, and laceration of the maternal soft parts.

### *Diagnosis of the Presentations.*

*First Occipital Presentation.*—Back to the left; heart sounds midway between umbilicus and left anterior superior spine; small fontanelle to the left forward; when in the pelvic outlet, palpable directly behind the symphysis. Passing from there along the sagittal suture the palpating finger arrives at the posterior large fontanelle. When the head is still in the cavity of the pelvis, the finger palpates behind the symphysis through the thinned segment of the as yet insufficiently dilated cervical canal (with intact membranes), somewhat laterally the lambdoidal suture and where the latter connects with that of the opposite side and the sagittal suture the triangular small fontanelle, etc. The palpating finger starting from the symphysis must always keep close to the pelvic periphery, then it is bound to reach some suture. If it is intended to enter the cervical canal, it must be

remembered that it points backward so that the finger can penetrate only with the distal phalanx flexed.

In anterior parietal presentation we find the large fontanelle near the symphysis and lower down than the small fontanelle. If the former is to the left of the symphysis the small fontanelle is to the right posteriorly; the head therefore is in the first or right oblique diameter (back to the right); *i.e.*, second anterior parietal or third occipital position. Therefore in the first and third occipital position it is in the first oblique diameter (second and fourth are in the second oblique diameter).

*First Brow Presentation.*—Back to the left; heart sounds heard most distinctly in the median line. The lowest presenting part behind the symphysis is the right tuber frontale; toward the right we palpate the supra-orbital margin, toward the left is the large fontanelle.

*First Face Presentation.*—Back to the left; but the heart sounds are hard to the right of the linea alba (because the back of the child is posterior, while its chest adjoins most closely the maternal abdominal walls in front to the right). To the right anteriorly we palpate the nostrils and the chin, to the left the forehead. Hence the right half of the face presents.

*First Breech Presentation* (the head in the fundus uteri).—Back to the left; heart sounds audible at the height of the umbilicus or above, about the median line. The finger palpates the gluteal fissure (after rupture of the membranes the contractions of the sphincter ani are perceptible) in the transverse or in the first (right) oblique diameter. The left buttock is in front anteriorly.

When the thigh has descended into the cervical canal we palpate either the triangular patella in knee positions or the foot; the lesser abduction possible to the great toe distinguishes it from the thumb.

*In Oblique Presentations.*—On both venters of the ilia large foetal parts are palpable; the pelvic inlet is empty; the heart sounds are audible in the neighborhood of the umbilicus; the palpating finger reaches a presenting shoulder—scapula, axilla, and clavicle; the relative position of these parts determines the position of the back and the head. Most frequently the back is in front, the head to the left; the rarest is back posterior, head to the right.

#### *General Treatment of the Presentations.*

(Further information will be found under the head of Pathological Pelves, §§ 21 to 33.)

It is a general principle to place the parturient always on that side which contains the foetal part which we desire to have descend downward and forward (first occipital presentation on the left, first face presentation on the right side). In the second anterior parietal presentation, therefore, the parturient is placed on the left side, because often the small fontanelle passes in the pelvic outlet from the right posteriorly to the right anteriorly (*i.e.*, a second occipital presentation results).

This failing, we choose the large fontanelle as the part next to descend, *i.e.*, left lateral position.

When danger threatens, the forceps are applied; when the child is dead craniotomy is performed.

During extraction the large fontanelle remains in front.

In anterior parietal presentations and Nägele's obliquity (sagittal suture near the promontory, Figs. 69 to 71), the large fontanelle may likewise descend; but it is lateral, not in front. The cause then is a flat pelvis (see § 23). Version or expectancy, placing the parturient corresponding to the large fontanelle; if the latter is in the true pelvis, corresponding to the small fontanelle. Then pressure from behind the symphysis upon the occiput and lower maxilla, possibly forceps.

Posterior parietal presentations arise usually in flat pelves, sometimes also in normal pelves and, if not diagnosticated, may lead to rupture of the uterus, version, or craniotomy.

In the pelvic outlet too the head may assume an inverted position, the sagittal suture lying in the transverse diameter. This is the "deep transverse position" of the head which results from a too rapid passage of the head, engaged in the transverse diameter, through the small transversely expanded pelvis (thus in the flat rachitic pelvis or else when the head is too small, though its straight diameter is still longer than the distance between the ischial tuberosities), etc.

If the labor is to be terminated the presentation must be corrected by the application of the forceps in the oblique position.

In brow presentations, as indicated above, the head should be pressed into the pelvic inlet because contraction of the pelvis is usually the cause. When the os is sufficiently dilated, version by one foot.



If this fails likewise, the only remaining indications are craniotomy and cranioclasia.

In face presentations with chin posterior, when the head is still high and movable, attempts must be made to bring the occiput down by external or combined manipulations, or else an effort may be made later to turn the chin forward by the forceps; otherwise version or, in most cases the only and preferable operation, craniotomy.

In pelvic presentations the chief and most urgent danger consists in compression of the funis after the passage of the presenting part, and in consequence thereof premature attempts at respiration or asphyxia of the child. Therefore from this moment a speedy termination of the labor is imperative; previous to this time, however, we must remain expectant, otherwise the arms will be turned up and the chin will move away from the chest.

Hence as soon as the breech is delivered, the trunk and the head are expressed by means of Kristeller's manipulation described in §12, aided by abdominal pressure. If this should not succeed at once, we free the legs, extract the trunk after loosening the funis, and bring down the arms as shown in Figs. 64, 66 to 68. The extraction of the head may then be effected by the Mauriceau-Lachapelle manipulation, or it may be expressed by the Wigand-A. Martin-Winkel manipulation.\* These attempts failing, pressure with both hands upon the fundus uteri may help; otherwise nothing is left but craniotomy, for such a resist-

\* The Prague manipulation is to be rejected as dangerous (laceration of the cervical spine), as has been shown by v. Winkel and Ahlfeld.



ance can be opposed only by an abnormally formed skull.

In oblique presentations, immediately after the rupture of the bag of waters, version by one foot is required; when danger is imminent, craniotomy.

As the pelvic inlet is not completely filled in oblique presentations, and as, furthermore, the bag of waters is large and apt to rupture early, foetal extremities and the funis may prolapse.

If the arm prolapses it is replaced, and the patient is so placed that the back of the child sinks to the side opposite to the prolapse so that the head can enter the pelvic inlet. Then we may remain expectant or apply the forceps as in the course of the figures last mentioned. In contracted pelvis, version.

If the foot prolapses alongside of the head, internal version is performed by the double manipulation of Siegemund; namely, a fillet is applied to the foot which is drawn down, and the head and shoulder are pushed back.

## § 52. ABNORMAL STATES OF THE FUNIS AND MEMBRANES DURING LABOR.

(Figs. 139, 141, 135.)

The life of the child is jeopardized by compression of the funis when the latter is coiled many times around the foetus; when the foetus passes through the coils (which is possible up to the fourth month) true knots result. Compression occurs also during prolapse of the cord (see Fig. 139) or from torsion during pregnancy (Fig. 141). The causes of the prolapse are the same as those which produce pro-

lapse of the extremities; briefly, insufficient filling of the true pelvis by a presenting large part of the foetus. This occurrence manifests itself usually on auscultation by the umbilical murmur (compare §§ 6 and 7). On palpation we feel a cord pulsating synchronously with the foetal heart; then we must effect its reposition,\* or better, resort to version and immediate extraction if the os is fully dilated; if not, combined version after Fehling, one lower extremity being left in the cervical canal with fillet applied.

Asphyxia of the child by hemorrhage is impending not only in placenta previa, but also in velamentous insertion; the great danger of the rupture of a vessel in this condition is shown in Fig. 135. The indication, therefore, is to effect rapid delivery, leaving the membranes intact as long as possible. The diagnosis is based on the palpation of pulsating vessels in the lumen of the os.

Retention of the placenta results rarely from adhesions due to endometritis, more frequently when it is of large size or when the uterus is flexed. The placenta is to be separated by the hand under strict antiseptic precautions.

Premature separation of the normally implanted placenta occurs in consequence of delayed rupture of the membranes, traumata, nephritis, infectious diseases, and the conditions productive of abortion.

*Symptoms.*—Hemorrhage; internally when contin-

<sup>1</sup> Reposition of the funis or of prolapsed foetal extremities should always be effected in the lateral position of the patient corresponding to the prolapse; afterward she is turned to the opposite side.

uing retroplacental, externally when passing into the cervix along the loosened edge of the ovum.

*Treatment.*—If the cervical canal is somewhat dilated, rapid delivery, perhaps by *accouchement forcé* or by Cæsarean section in atony of the uterus, after failure of hot injections, tamponade, and ergotin.

## PART VIII.

### **Disturbances of Labor Caused by Abnormal Uterine Contractions and by General Diseases of the Mother.**

#### § 53. GENERAL REMARKS ON DIAGNOSIS AND OPERATIVE INDICATIONS IN DYSTOCIA.

Thus far we have discussed the disturbances of pregnancy and labor which can be strictly demonstrated anatomically. Upon this basis I present the following diagnostically important scheme of the disturbances of the mechanism of labor.

##### **I. Abnormal resistances on the part of the mother:**

- (1) Contracted pelvis;
- (2) Contractions, developmental anomalies, or tumors of the soft parts.

##### **II. Abnormal resistances on the part of the ovum:**

- (1) Unfavorable presentations, positions, and attitudes of the child.
- (2) Anomalous shape of the child (hydrocephalus, tumors, malformations);
- (3) Anomalous shape, contents, and position of the membranes and the funis.

**III.** Abnormally slight resistances on the part of the bony and the soft parturient canal on the one hand and the child on the other hand, with energetic uterine activity—causes deep transverse position of the head and precipitate labor.

As a further group we have the purely functional disturbances of parturient activity due partly to anomalies in abdominal pressure and uterine contractions, partly to general diseases and other defects of the organism; *i.e.*,

IV. Functional disturbances of parturient activity due to:

- (1) Anomalous contractions,
- (2) Other diseases of the mother.

When the results of these anomalies endanger the life of the mother or child in a definite manner the moment for operative interference has arrived. Such results and symptoms indicating operation have been found thus far:

A. On the part of the mother:

I. Symptoms presented by the genital tract:

- (1) Extreme distention of the lower uterine segment, ascent of the ring of contraction from a hand's breadth above the symphysis to the navel or higher (great pain and tenderness persisting in the pauses between the contractions, small weak pulse);
- (2) Rupture of the uterus (see § 42; when the child has passed completely into the abdominal cavity, symptoms of shock and disappearance of the presenting part, in place of which there is hemorrhage from the genitals);
- (3) Threatening rupture of an ectopic ovisac or cystoma (also hæmatoma or thrombus of the vulva, especially in twin labor) or of the overfilled bladder (*e.g.*, in incarcerated retroflexed uterus);

- (4) Threatening erosions, pressure necroses, vaginal and perineal lacerations (in rigidities, stenoses, funnel-shaped pelves—pallor of the frenulum);
- (5) Great painfulness of the pelvic articulations, indicating impending rupture of the joint capsules (contracted pelves);
- (6) Hemorrhages (in placenta previa, premature separation of the placenta, besides in the lesions named above);
- (7) Infectious intoxications, with fever or comatose or hectic conditions:
  - (a) Sepsis with a temperature of 100.5° F., pulse of 100 and above, starting from local lesions of the sexual tract or from a decomposed ovum;
  - (b) Eclampsia (see § 50);
  - (c) Tuberculosis (the parturient act becomes grave owing to the loss of blood and the muscular fatigue; hence the artificial termination of the labor and anæsthesia in the second stage are indicated. On the other hand the pregnancy *per se* is generally not unfavorable).
- (8) Other organic diseases unfavorably influenced by parturition; e.g., heart lesions which according to Fritsch are apt to cause paralysis of the heart and œdema of the lungs owing to the increased blood pressure produced by the uterine contractions.

**B. On the part of the child.**

- (1) Persistent retardation of the heart sounds to

100 and less, or permanent increase of the same above 160, associated with feebleness (umbilical murmur);

- (2) Escape of meconium;
- (3) Prolapse of the funis (see § 53);
- (4) Hemorrhages from foetal-placental vessels in velamentous insertion or placenta previa.

#### § 54. RECIPROCAL EFFECT BETWEEN PREGNANCY AND DISEASES OF NON-SEXUAL ORGANS.

As has been stated in §§ 49 and 50, general infectious diseases cause abortion, partly by producing locally endometritis and decidual hemorrhages, partly by heat congestion. In the case of typhoid fever most patients recover with abortion; in variola, without abortion; in cholera recovery and death either with or without abortion are equally frequent (Goldschmidt). An indication for the artificial induction of abortion is never presented.

In like manner the induction of premature labor should never be practised in the case of heart lesions (ether) or diseases of the lungs (compare the scheme in § 53).

On the other hand, the induction of premature labor may be indicated in eclampsia (§ 50), chronic nephritis (amaurosis), progressive pernicious anæmia, hyperemesis gravidarum (§ 7), and chorea gravidarum.

## § 55. ABNORMAL UTERINE CONTRACTIONS.

(Figs. 35, 36, 110.)

A. Excessive contractions and tetanus of the uterus appear with insuperable resistance, as in oblique presentations after escape of the liquor amnii and especially after prolonged and unsuitable attempts at delivery and from exhibition of ergot. These tonic contractions are of no effect in furthering the delivery, but on the contrary they endanger the integrity of the lower uterine segment and cause the death of the child.

*Treatment.*—The labor must be terminated immediately, in oblique presentations by embryotomy; but first the tetanus of the uterus must be overcome by profound anæsthesia or by the exhibition of morphine gr.  $\frac{1}{4}$ , with atropine gr.  $\frac{1}{64}$ . But this relaxation by narcotics can often no longer be obtained when the contractions have already produced extreme distention of the lower uterine segment; moreover, narcotics are dangerous when the temperature is high owing to the weakness resulting from infection, hence there is nothing to be done but embryotomy.

Spastic strictures owe their origin to the same causes as the tonic spasms and naturally are anatomically possible only at the points possessing sphincter-like muscles, *i.e.*, at the tubal angles and the internal os (see Figs. 35, 36). The occurrence is rare during the delivery of the child (as in Kaltenbach's case, which is of forensic importance, in which the stricture in the region of the internal os had constricted the neck similar to a coiling of the funis),



and is met with chiefly in the third stage in which it may cause retention of the placenta. Treatment by narcotics.

Excessive contractions, when the resistance of the parturient canal and of the child is diminished, cause precipitate labor. The anatomical substratum for excessive contractions, namely, hypertrophy of the muscles of the fundus, is not rarely inherited; otherwise, according to v. Winckel, besides the factors stated, numerous pregnancies and an abnormally short funis have a predisposing effect.

*Treatment.*—Placing the patient in the lateral position, forbidding abdominal pressure, early protection of the perineum. In spasmodic pains anæsthesia and sinapisms.

B. Weak contractions. These result primarily from general debility, in anæmic patients or those weakened by hunger or disease; sometimes they are due to an insufficiently developed muscular coat of the uterus, whether physiologically on account of the age (very young or very old primiparæ) or from defective involution (especially after miscarriages) or from developmental anomalies (uterus bicornis and unicornis, § 41) or from tumors in the uterine wall or abnormal distention (polyhydramnion, multiple pregnancy, etc.) or from loss of blood (placenta previa) or from inflammatory diseases and lesions of the uterus or from the faulty position of the latter. An indirect effect is produced by insufficient abdominal pressure (in the second stage of labor) and overfilling of the pelvic organs or their inflammation.

In the diagnosis all these etiological factors should be given due consideration; besides, the strength and

duration of the pains and the intervening pauses should be repeatedly observed on the fundus, and judged by the advance of the child and the dilatation of the entire cervical canal. The bladder and rectum should be examined with reference to their fulness. Finally the general condition of the patient should be noted (temperature and pulse); after the escape of the liquor amnii the foetal heart sounds should always be counted.

Atony of the uterine muscle entails dangerous hemorrhages in the third stage of labor.

*Treatment.*—The pains should be stimulated by hot baths, hot vaginal injections (95–117–128° F. [v. Winckel], a pailful to be used each time, 0.3 per cent salicylic acid or 0.25 per cent lysol, every one or two hours), hot cataplasms to the fundus, the insertion of the colpeurynter (chiefly in hyperdistention of the uterus by multiple pregnancy, polyhydramnios—artificial rupture of the membranes—less so in inflammatory affections). The bladder and rectum should also be evacuated; stimulants. Obstetrically the measures to be considered are, expression of the foetus after Kristeller, Fehling's and Ritgen's manipulations (§ 12), and expression of the placenta, always conjoined with friction of the fundus to guard against atony. In the third stage, ergot or ergotin; these can be employed in the second stage only when there are no longer any abnormal resistances, provided artificial delivery is not to follow immediately.

It is precisely these abnormal resistances which cause secondary weak contractions; if the labor is unduly prolonged the child dies after the escape of the liquor amnii and the danger of the invasion by

microbes is proportionately increased. Hence artificial delivery is called for, combined with continuous friction of the fundus. Ergot and ergotin are to be given, but only at the moment of delivery.

Should atonic hemorrhage still continue, the uterus is to be tamponed according to Dührssen (see § 48 and Fig. 110).

## PART IX.

## General Observations on Obstetric Therapeutics.

## CHAPTER I.

## § 56. DRUGS EMPLOYED IN OBSTETRIC PRACTICE.

Drug.	Dose.	Indication.
1. Ether .....	Inhalation .....	Anæsthesia, also during labor.*
2. do. every 15-30 minutes.....	℥xv. = 1 syringe-ful .....	Stimulant in metrorrhagia and heart lesions.
3. Alcohol : brandy and red wine .....	fl. ʒ v. and ½ bottle .....	Puerperal fever (Runge).
4. Antifebrin .....	gr. iv.-viiij., 1-3 times daily.	do. } parametritis, typhoid gravidarum, pyrexia of parturients.
5. Antipyrin .....	gr. viij.-xv., 1-3 times daily.	do.
6. Silver nitrate .....	2%, gtt. i.-ij. ....	Ophthalmoblenorrhœa neonatorum.
7. do. 90-95° F. ....	1%, fl. ʒ v. pro dosi .....	Vesical injection in cystitis.
8. do. ....	2% .....	Irrigation in gonorrhœal colpitis.
9. do. ....	Solid stick .....	Cauterization of puerperal ulcers.
10. Potassium bromide .....	gr. xv. pro die .....	Hyperemesis gravidarum, salivation, psychoses.
11. Calomel .....	gr. ss.-iss., 3-4 times daily	Laxative in uterine lesions, in the puerperium.

12. Calomel† (vap. par.) .....	gr. xv. in fl. 3 iij. olive oil, 4-6 syringefuls.	In 8-10 days for syphilis in pregnancy.
13. Oxyiodate of bismuth .....		In syphilitic ulcers during pregnancy.
14. Mercurial plaster .....		In dry syphilitic papules during pregnancy.
15. Benzoated tinct. of sublimate .....	gr. xv. in fl. 5 iij. ....	In syphilitic mucous patches during pregnancy.
16. Carbolic acid .....	3 iij. in alkaline alcohol, fl. 5 iij.; 2-2½%.	Uterine irrigation.
17. Catgut, dry sterilized .....	Hardened in 2% chromic acid.	
18. Quinine sulphate .....	gr. iv.-viiij., 2-4 doses in the evening.	In puerperal fever.
19. Chloral hydrate .....	Up to gr. xlv. as a dose.	During labor as narcotic.*
20. do. ....	gr. xv. in 3 iss. per rec- tum.	After each attack in eclampsia.
21. do. { with Syr. cort. aur., aa 3 ss. Aq. destil. fl. 3 vi.	1 tablespoonful 3-4 times a day.	Up to fl. 3 iij. pro die in eclampsia. In weak pains, local analgesic.*
22. Chloral hydrate, gr. xxiv. in Aq. dest. fl. 3 iij.	1 tablespoonful every 2 hours.	In hyperemesis gravidarum.
23. Chino-iodine in place of iodoform .....		To puerperal ulcers, to stimulate granu- lation.

\* There is no ideal anæsthetic for parturition, one which combines analgesia with complete preservation of the expulsive forces. The best is nitrous oxide with oxygen in the proportion of 4 : 1. Chloroform is most effective when the os is almost fully dilated and also when the head distends the vulva (v. Winckel); but, although according to Spiegelberg, the pains stimulate cardiac activity, it is risky, when the muscular tissue of the heart is altered, to induce anæsthesia unless it is absolutely necessary.

† Instead of calomel, salicylate of mercury 1 pt. in 10 pts. of olive oil may be preferred for injection—into the gluteal region—being less liable to cause abscesses.

DRUGS EMPLOYED IN OBSTETRIC PRACTICE—*Continued.*

Drug.	Dose.	Indication.
24. Chloroform.....	$\bar{z}$ iij. to ether $\bar{z}$ i. and alcohol, $\bar{z}$ i.	According to Billroth for anæsthesia.
25. Chloroform, $\mathfrak{m}$ xv.; ether $\mathfrak{m}$ xxx..	Local friction..... } $\bar{z}$ i. } Local friction..... } $\bar{z}$ i.	Labor pains, lumbago, etc.
26. Chloroform, fl. $\bar{z}$ i.; ol. hyosc.; fl. $\bar{z}$ iij.		
27. Cocaine hydrochlorate.....		
28. do. gr. iij. in $\bar{z}$ iss. water.....	gtt. v. every 4 hours ..	Local application to cervical canal and vulva, during labor.
29. do. powder.....	gr. ss., 3 times.....	Labor pains, hyperemesis, excessive pains.
30. Tinct. cinnamomi.....	gtt. x.-xv.....	Adjuvans in weak pains, atony.
31. Creolin solution.....	$\frac{1}{2}$ – $\frac{2}{3}$ %.....	Antiseptic uterine irrigation.
32. Lyso, 1%, does not dissolve in "hard" water; disinfects and	gr. $\frac{1}{2}$ hypodermically.....	Lubricates the vagina, is not poisonous.
33. Ergotin, dialyzed.....	gr. $\frac{1}{2}$ hypodermically.....	Weak pains, atony, hemorrhages, abnormal adhesion of placenta.
34. do. gr. xl.; Aq., fl. $\bar{z}$ ss.; syringeful.	Ac. salic., gr. $\frac{1}{2}$ ; $\frac{1}{3}$ to 1	
35. Extr. ergot. aquos.....	Pills, gr. $\frac{1}{4}$ pro dosi.....	
36. do. do. 3 ss.-i.; Aq. fl. $\bar{z}$ vi.	1 tablespoonful every 2 hours with gtt. xv. tinct. cinnam.	3-4 a day, perhaps with gtt. xv. tinct. cinnamomi.
37. Ergot, powdered.....	gr. viij.-xxiv. pro dosi, 3 times in 10 minutes.	Weak pains, atony, hemorrhage, abnormal adhesion of placenta.
38. Infusion of ergot $\bar{z}$ ss. in aq. fl. $\bar{z}$ vi. (with acids)	1 tablespoonful every 15 minutes.	In hemorrhage; is better borne than powders.

39. Liquor ferri chloridi .....	Diluted to wine-yellow color.	2-3 saturated tampons placed as last resort in uterus for atony.
40. Iodoform .....	Powder .....	Puerperal ulcers; does not irritate.
41. do. bougies, $\mathfrak{D}$ iv. - 5 iss.; glycerin and acacia, $\mathfrak{a}\mathfrak{a}$ gr. ix.	2-2 $\frac{1}{2}$ inches long .....	Introduced into cervix in puerperal endometritis.
42. Iodol-glycerin .....	Upon tampons .....	In puerperal endometritis and colpitis.
43. Iodol and dermatol .....	Powder .....	Bedsore.
44. Ipecac .....	gr. iss.-ivss. ....	To induce vomiting in weak pains.
45. Irrigations .....	Hot (117-122-129° F.) ....	$\frac{1}{2}$ -1-2 quarts into the uterus, in hemorrhage.
do. ....	Warm (82-111° F.) ....	To stimulate contractions for premature labor.
do. douches. ....	Cold .....	In inversion of the uterus, in bleeding vaginal lacerations.
do. ....	Ice-cold .....	In uterine hemorrhage.
46. Application of ice .....		(1) In hemorrhage from lacerated cervix and vaginal fornix, in the puerperium from ectopic pregnancy, in hæmatoma of the vulva; (2) prophylactic, after obstetric operations, especially Cæarean section, after artificial removal of placenta and retained membranes, after rupture of the uterus; (3) in infections—puerperal fever, parametritis, diseases of the pelvic articulations; (4) in inversion of the uterus.

DRUGS EMPLOYED IN OBSTETRIC PRACTICE.—*Continued.*

Drug.	Dose.	Indication.
47. Laxatives for gravid and puerperal women.	Progressively effective (acc. to v. Winckel.) $\frac{1}{2}$ –1 teaspoonful . . . . . 2 tablespoonfuls = 1 wine-glassful. gr. ss.–iss., 3–4 times a day.	Daily 1–2 pints lukewarm high enema through irrigator, in lateral position; castor oil per anum, or 2–4 capsules per os; pulv. magnesia usta cum rheo; comp. licorice powder; decoction of rhamnus frangula bark; Mineral waters. Drastics must be avoided during pregnancy. Calomel (see above) after rupture of the uterus (followed by opium) and perineal sutures.
48. Extr. rhei comp. and extr. colocyth., āā ʒij.	1–3 times a day. . . . .	In eclampsia and other renal diseases, combined with warm baths (99.5° F.) and packs.
49. Oil of turpentine. . . . .	$\frac{3}{4}$ ss.–i. per enema. . . . .	In meteorism—peritonitis.
50. Tinct. opii . . . . .	gtt. xv.–xxx . . . . .	Tetanus of the uterus, threatening abortion, after perineal suture, rupture of the uterus, puerperal fever.
51. do. . . . .	gtt. x.–xx . . . . .	Per enema, in metrorrhagia.
52. Extr. mecon., ʒij.; lanolin, ʒ iss.; ol. oliv. fl. ʒ iiij.	Local. . . . .	Labor pain.
53. Morph. hydrochlor., gr. vi.; Aq. mclx. (1 syringeful = gr. $\frac{3}{8}$ ).	gr. $\frac{1}{2}$ – $\frac{3}{4}$ to be injected within 4–7 hours, not to exceed gr. ij.	In eclampsia, contracted pelvis during labor, stricture of the uterus, after Cæsarean section (comp. Opium).



54. Morph., gr. 1½; atrop., gr. ʒv; 1 syringeful mxxx . . . . .	In tetanus of the uterus, also before anæsthesia.
55. Morph. hydrochlor. . . . .	gr. ʒ injected.
56. Emuls. amygdal., ʒ liiss.; extr. hyoseyami, gr. i.	Into ectopic ovisac.
57. Ol. hyoseyami, fl. ʒ vi.; chloroformi, fl. ʒ iij.	In metrorrhagia.
58. Phenacetin . . . . .	Externally . . . . .
59. Ac. salicyl., gr. xlv.; amyl. trit. ʒ ss.	In sacralgia, etc.
60. Concentrated salicylated alcohol.	Puerperal fever.
	Puerperal ulcers.
	For the sterile preservation of laminaria tents, or immersion for 2-5 minutes in boiling carbolic or sublimate solution, or preservation in iodoformed or sublimated ether (v. Herff).
61. Sulfonal. . . . .	gr. xxx.-lx. pro dosi . . . . .
62. Tartar emetic. . . . .	gr. ¼-½ pro dosi . . . . .
63. For palpation: 1% creolin mollin, lysol 1%; but the latter dissolves only in "soft" water.	To excite vomiting in weak pains.
	lin, or 5% carbolized vasoline, or, best,

## § 57. GENERAL PREPARATIONS FOR DELIVERY AND ANTISEPSIS.

When the physician is called to a case of labor he should take the temperature. At the same time he will obtain the age and history, ascertain whether rickets has been present or if there are other organic defects or diseases, learn the facts about earlier pregnancies, the time of the last menstruation, and the course of the labor up to his arrival. The statements are verified and supplemented by the examination (§§ 6 and 7), during which the fulness of the bladder must not be overlooked.

The internal examination is to be preceded by the most careful disinfection. This is effected most rapidly and certainly by brushing for three minutes with a one-per-cent lysol solution (made with "soft" water), all visible stains having been previously removed. Special attention is to be given to the margins and the free edges of the nails, each finger being treated separately.

Another way is brushing for five minutes in warm soapsuds, rinsing in fresh water, brushing for two minutes with three-per-cent carbolic acid or one-per-cent sublimate solution. After that no object must be touched that has not been disinfected.

Unless the nurse has meantime done so, the physician then cleanses the vulva with one-per-cent lysol solution (or with soap followed by three-per-cent carbolic-acid solution); if necessary the perineum

and the lower half of the labia are shaved (the rectum having been previously emptied); then follows catheterization, the vagina is irrigated, and the fingers having been again brushed, the vagina is anointed with one-per-cent lysol solution with the finger. The latter manipulation may be omitted, but is required after an examination by another person.

Instruments, catheter, etc., are sterilized, and cooled in a three-per-cent carbolic solution in which they remain, together with the siphon rubber tube. It is necessary to place in readiness two basins for washing and personal disinfection, one dish with carbolic solution for the instruments, one pan for boiling the latter, clean towels and bed linen, a pail, a bed-pan.

Uterine irrigations (with two to two and a half per cent carbolic, one per cent lysol, or creolin solution) are performed either by engaging the cervix in a Cusco speculum (Zweifel-Döderlein) or by inserting two fingers and exerting counter-pressure upon the fundus, using the return-flow catheter of Fritsch-Bozeman. They are resorted to only when infection is suspected or has been rendered possible by examinations or operative interference. The finger must guide the point of the catheter to the fundus (that is, above the ring of contraction which is to be palpated). The tube and catheter contain no air, but at first only sterilized water, and not until the outflow is assured is the antiseptic solution added to the water first present in the irrigator. In the same way no air must be allowed to follow the rest of the fluid.

In the puerperium the external genitals are rinsed twice a day with a weak sublimate or one-per-cent

lysol solution. The draw sheets and the sterilized vulvar pads are changed accordingly.

The same measures are applicable for operative interference.

---

## CHAPTER II.

### SURGICAL THERAPEUTICS.

#### § 58. EVACUATION OF THE UTERUS.

1. Fritsch's metallic and Hegar's hard-rubber dilators serve for rapid dilatation for the removal of retained secundines after miscarriages or full-term deliveries.

The removal of the remnants after abortion is effected by the curette, portions of placenta by the fingers (for the *modus operandi*, see "Atlas of Gynecology").

2. Abortion is induced by means of laminaria tents one and a half to two inches in length. They are preserved in a ten-per-cent alcoholic solution of salicylic acid, or are sterilized by boiling for from two to five minutes in carbolic or sublimate solution. They are introduced through the speculum, the anterior lip of the os being fixed with dressing forceps. An iodoform-gauze tampon keeps them in place. Usually after twenty-four hours the ovum is removed with the curette; after the formation of a serotinal placenta (*i.e.*, with the beginning of the fourth month), with the finger. Rest in bed for a week.

*Indications.*—(1) Absolute pelvic contraction, the shortest straight diameter measuring 5.5 cm.; (2) a pelvis narrowed by tumors, provided they cannot be

extirpated, diminished, or favorably displaced—while this indication is very rare, it applies to uterine cancer; (3) irreducible displacements of the uterus, multiple myxoma of the villous chorion (hydatidiform mole).

3. Premature labor is induced by the introduction of an elastic bougie (disinfected for several hours in carbolic or sublimate solution) between the ovum and the anterior uterine wall, guided by the finger passed into the cervical canal. Should this method of Krause fail, the membranes are to be ruptured according to Scheel's method.

The thin-walled uterine bag (Barnes, Tarnier, Fehling) is introduced, filled with water, and, according to the method of Mäurer-Dührssen, so fastened externally as to exert pressure. Tarnier's écarteur, with arms diverging through the traction of rubber rings and inserted into the cervix, may be used for dilatation. The further progress of the labor should be as far as possible spontaneous.

*Indications.*—(1) Contracted pelvis, see §§ 21, 22; (2) placenta prævia; (3) habitual death of the foetus at a definite period; (4) hydramnion.

## § 59. SURGICAL OBSTETRICAL MANIPULATIONS.

(Fig. 110.)

1. Lateral perineal incision, medially from the tuber ischii, 1 to 3 cm. long, 1 cm. deep; compare § 12.

2. Dührssen's vagino-perineal incision (in a direction midway between anus and tuber ischii) severs the constrictor vaginae and nicks the levator ani. It is made with scissors, and is 4 cm. long and 3 cm.

deep if bilateral; it is better made unilateral, and 5 to 6 cm. long.

*Indications.*—Rapid delivery by forceps or podalic extraction in primiparæ when the muscles named are unyielding. In the case of cicatricial or congenital rigidities the strictured spots are correspondingly incised (comp. § 39).

The suture is laid first through the point of the wound, which is retracted upward and sideways; analogous to perineoplastic sutures, the vaginal wound is then united with catgut, the lower perineal wound with silkworm gut or silk. During extraction hemorrhage is controlled by arterial forceps.

3. Sutures for perineal lacerations begin at the anus and are placed transversely. The needle is inserted in the healthy tissue, and passes under the raw surface to the opposite healthy side, in the form of button sutures or in two or three layers of a continuous suture; the material for the rectum being silkworm gut or silk, either of which is more durable than catgut.

Perineal ruptures are often associated with vaginal lacerations along the posterior rugous column. Lacerations extending only into the perineum are said to be of the first degree; when reaching to the sphincter ani, of the second degree; when passing through the sphincter, of the third degree. (For illustrations, see "Atlas of Gynecology.")

4. Lacerations of the clitoris have caused fatal hemorrhage;\* hence they should be carefully sutured.

\* In the Munich Gynecological Clinic is a uterus pregnant with twins from a patient near term who had fallen upon the back of

5. Cruciform incisions into the external os with scissors or the knife in agglutination or secondary atresia of the os (comp. §§ 39, 43).

6. Superficial incisions into the external os when it alone is rigid, *i.e.*, according to Dührssen, has lost its elastic fibres by senile atrophy near the climacteric, after amputation of the cervix, in syphilitic and commencing cancerous degeneration. The obliterated cervix firmly adjoins the presenting part in the shape of a thick border (compare §§ 43, 39).

These incisions are made only after narcotics have failed; but if danger threatens, the following are resorted to:

7. Several (four) deep incisions extending to the vaginal attachment of the cervix are made \* (Skutsch-Dührssen, for illustration see "Atlas of Gynecology"). The margin of the os is fixed with two fingers or two bullet forceps, and divided between by scissors. As the patients are usually old primiparæ, the operation must sometimes be combined with that enumerated under 2. Additional indications are eclampsia and premature or artificial rupture of the membranes. When the entire cervix is rigid, no incision but Cæ-sarean section is called for, as the condition is generally due to epithelioma.

8. *Accouchement forcé* has for its object dilatation of the cervical canal by the introduction of one finger,

a chair and bled to death from a fissure adjoining the clitoris resulting from the accident; the specimen is pictured in v. Winkel's "Obstetrics."

\* This operation must never be performed by the inexperienced and whether the expert will be able to secure good results by its means is an open question.



followed by several fingers, and finally of the whole hand, with a view to perform version and extraction. It is indicated only in premature separation of the placenta and dangerous internal hemorrhage.

9. Dührssen's tamponade of the uterus with sterile iodoform gauze has been mentioned in §§ 47, 48, and Fig. 110.

10. Irrigation of the uterus has been described in § 58. (For illustration, see "Atlas of Gynecology.")

#### 11. Cæsarean section.

Cæsarean section is intended to replace craniotomy; the more favorable the results of the former the less often will the life of the child have to be sacrificed to that of the mother. Its indications, therefore, are: (1) Absolute, when the mutilation of the child cannot be followed by extraction *per vias naturales*, the shortest straight pelvic diameter being 5.5 cm. and less; (2) the same in the case of irremovable tumors filling the pelvis; (3) relative, when the extraction of the mutilated child would be possible, but the mother desires a living child; (4) in irreducible hysterocele; (5) in cicatricial adhesions of the uterus and vagina of such an extent that neighboring organs would be injured by delivery *per vias naturales*; (6) after death of the gravida, the child being living and viable (living twenty-five minutes after the death of the mother).

I. Veit advised for cases with relative indication to choose a time when the genital canal was still sure to be aseptic.

Sänger rehabilitated the old conservative Cæsarean section by devising a mode of closing the uterus toward the abdominal cavity with a reliable suture based



on antiseptic methods. The mortality in pre-antiseptic times was 54 per cent and more (Zweifel, Meyer); since the introduction of Säger's mode of suture to 1887, 28 per cent (Crédé); to 1889, 8.6 per cent (at the same period: induction of premature labor, 2.2 per cent; version and extraction, 4.8 per cent.; craniotomy, 28 per cent mortality); and to 1892, only 6.4 per cent in the combined results of Leopold and Zweifel's clinics (47 Cæsarean sections with 3 deaths, while Leopold had no death from craniotomy with a true conjugate measuring less than 7.5 cm.). Other operators, however, give a mortality of 32 per cent.

These statistics are important as regards prognosis, especially as viewed by the patient and her relatives, in comparison with craniotomy and bearing in mind the proviso of Veit mentioned above.

*Performance.*—Strictest antisepsis (see Cœliotomy in my "Atlas of Gynecology"); two assistants, one for administering anæsthesia; operation to begin before rupture of the membranes and after the first vigorous pains (aided by injection of ergotin). Incision as for every cœliotomy; uterus to be turned forward, cervix constricted with a rubber tube about the thickness of the little finger; abdominal cavity to be temporarily closed. The uterus is opened by a longitudinal incision in the middle of the anterior wall; if the placenta presents (perhaps to be ascertained beforehand by puncture) it is pushed aside. The assistant keeps the upper and lower angle of the uterine wound apart (lest the uterus contract too rapidly and grip the child to be extracted). The membranes are perforated; while one hand is passed within and

finds the head, the other external hand turns out the breech; the head follows (if necessary, the wound is enlarged by means of a guarded knife). The cord is tied, the placenta separated by hand, and the interior of the uterus disinfected.

Suture of the wound, which measures about 15 cm.: either eight to ten sutures passing through the entire wall and about ten to twelve superficial sutures embracing the peritoneum, which folds in of itself; or else, according to Fritsch, fifteen simple silk sutures uniting the entire thickness of the wall. The elastic tube is loosened; the atony which succeeds may be counteracted by introducing previously into the uterus pieces of ice, or subsequently from the vagina an iodoform-gauze tampon. Then follow the toilet of the abdominal cavity, suture of the abdominal wall, etc. (compare Cœliotomy, in my "Atlas of Gynecology"). After-treatment (*ibid.*), ice bladder, morphine, little to drink for four or five days, no solid food.

12. Porro's partial hysterectomy by cœliotomy: supravaginal amputation, the cervix having been constricted with a rubber tube as above. Extra-peritoneal treatment of the pedicle: the visceral peritoneum of the stump is sutured with the parietal peritoneum of the lower angle of the wound.

*Indications.*—(1) In combination with myomotomy; (2) in septic endometritis, especially when the uterus is ruptured and lacerated; (3) in uncontrollable uterine hemorrhage (in place of Cæsarean section); (4) in extensive cicatricial stenoses which firmly close the vagina; (5) in pregnancy of a rudimentary uterine cornu; (6) in irreducible inguinal hernia of a

gravid uterus bicornis; (7) in profound puerperal osteomalacia.

13. Cœliotomy in extra-uterine pregnancy and in complete rupture of the uterus, with escape of the ovum into the abdominal cavity (comp. Cœliotomy in my "Atlas of Gynecology").

14. Symphyseotomy (comp. § 21).

## § 60. GENERAL REMARKS ON OBSTETRIC OPERATIONS.

(Figs. 116, 139.)

### *Preliminary Examination and Preparations.*

The operator must inform himself accurately in advance of the nature of the pelvis, the dilatability of the soft parts, especially the width of the os, of course the presentation of the child, and in particular the position of the presenting part (how low in the pelvis; in which diameter, for instance, is the sagittal suture; whether the large or small fontanelle is lower; whether there is, perhaps, posterior parietal presentation, etc.), and, finally, as to some decisive indication, whether there is danger for mother or child. (Weak pains are no indication for forceps.)

Three questions, then, present themselves: (1) Is there an indication for interference? (2) Which operation is indicated? (3) Has the important moment for interference arrived? This moment depends on the position of the head and the width of the os. Internal version, forceps, and craniotomy require an os sufficiently dilated for the presenting part to pass, but then the time is ripe. For the forceps the head must be held firmly enough; for craniotomy it must be low enough.

The operations are performed under the most careful antisepsis (comp. § 57), the patient being placed across the bed, the legs resting upon two chairs, the back supported by high pillows; only for version the patient is placed in the lateral position, corresponding to the feet of the child. When the patient is in the left lateral position the right hand of the operator is used for internal manipulation; it is introduced at the end of a pain. It is passed up along the presenting side of the child as far as the bend of the hip and thence to the foot, while the external hand exerts counter-pressure upon the breech. Version is made upon the lower foot, *i.e.*, corresponding to the presenting side (Fritsch, v. Winckel); it is completed when the knee is in the vulva. Fillet to be applied.

Anæsthesia must be profound, the chloroform being dropped regularly upon the mask, but afterward be kept close to the point of awakening. The bladder must be evacuated before operation.

### *I. Version and Extraction.*

A. External version is performed only when the membranes are intact in the case of oblique presentations. The patient is placed on the side corresponding to the head of the child. This failing, we resort to—

B. Combined indirect version, after Braxton Hicks, the membranes being still intact and long before complete dilatation of the os.

If it is intended to bring down one foot, it will succeed at this time before the complete dilatation of the os (according to v. Winckel and v. Hecker), in case

the shoulder presents, by grasping a knee with two to four fingers and guiding it down immediately after. Should this likewise fail, nothing remains but—

C. Combined direct version upon the feet, by introducing the whole hand into the fully dilated os. At the moment when the membranes rupture there is as yet no danger as regards the stretching of the lower uterine segment (Winter). Direct version upon the head is performed only when the pelvis is not markedly contracted and there is no reason for hastening the delivery; the methods are those of D'Ou-trepont and Busch.

If the moment of the rupture of the membranes has passed, the presenting part must not be firm in the true pelvis, nor must the ring of contraction be higher than one hand's breadth, not even more than 5 cm. above the symphysis, when the fundus uteri at the same time manifests itself as a hard ball.

Indications for combined direct version upon the feet:

(1) When it is impossible for the head to enter the pelvic inlet and the pelvis is contracted only to the first or second degree (*i.e.*, readily admits the fist of the operator), and the child is at least seven months old (immature foetuses pass safely *conduplicato corpore*). The impossibility may be due to oblique presentations, brow and face presentations with chin posterior, and particularly if complicated with prolapse of an extremity, posterior parietal presentation, and the like.

(2) When danger threatens before the head will admit of the application of the forceps, so that extraction cannot immediately follow—for instance, in pro-

lapse of the funis; in placenta prævia, when the leg is brought down to act as a tampon.

(3) After craniotomy, if direct extraction should fail.

Turning, as such, is effected by aid from without. It is done between pains, by drawing the foot over to the head end of the child, whereby the breech is brought away from the ilium. In stricture of the lower uterine segment the other foot is also brought down, and Siegemund's manipulation is employed, but with care. In case of failure, embryotomy is performed. The same rule applies to tetanus of the uterus persisting in spite of anæsthesia. The prolapsed funis is not replaced.

Extraction follows immediately after version only when the child is in danger; but then, too, the membranes must have ruptured and the os be fully dilated.

The transformation of brow and face presentations into occipital presentations by external and internal manipulations, according to Schatz, Baudelocque, and Baudelocque-Playfair, has been mentioned in § 51. The same remark applies to—

Expression after Kristeller, Hofmeier, Hohl, Fehling and Smellie-Ritgen in first-coming head; after Mauriceau-Lachapelle (Levret or Veit-Smellie), Wiegand-A. Martin-Winkel in after-coming head; expression of the placenta after Credé, and after having been manually separated.

Extraction by the shoulder, and, finally, reposition of the funis or of prolapsed extremities, are partly described in § 12 and partly in § 51.



## *II. Extraction with Forceps.*

The forceps operation is indicated when danger threatens the mother or child. Weak pains and pelvic contraction by themselves are no indications. The preliminary conditions are of importance: (1) The head must be in the pelvic inlet, at least to the largest periphery; (2) the os must be fully dilated, *i.e.*, to 8 cm. In hydrocephalus the forceps must not be applied, nor in markedly funnel-shaped pelvis.

A contracted pelvis counterindicates the forceps; they are applied only when the foetal heart sounds have fallen below 100 or have risen above 160, or when the mother in prolonged labor has become too exhausted to force the head through the pelvic inlet, or when the soft parts have become bruised or profuse hemorrhage has set in, or when the temperature has risen above 101° F. and the pulse to 100. In posterior parietal presentation craniotomy is called for. When the head is lower and quite transverse, the forceps are applied obliquely, not over the brow and occiput.

The head really occupies the ideal forceps position when it has entered the outlet with the small fontanelle in front. Then the forceps can be applied most effectually and safely by grasping the foetal bitemporal diameter. The tip of the forceps then lies at the base of the cranium. Thus applied,\* the forceps

\* The attempt will always first be made to press the head as low down as possible through the pelvic inlet so that the promontory will be beyond reach, in other words so that the sagittal suture has passed away from it and the small fontanelle has descended forward.

must first turn the head with the sagittal suture into the straight diameter, *i.e.*, rotate it around its oblique diameter. This, like extraction, is not done by jerks or with extensive lever movement, but by steady traction with intervals, at most aided by very slight lateral movements.

We remember that the head passes through the pelvic inlet with approximation of the chin to the chest. The chin leaves this position only when the head reaches and distends the perineum, *i.e.*, becomes visible in the vulva.

We must repeat the same rotations with the forceps. Therefore, while we rotate about the large oblique diameter of the head, the handles are kept depressed, straight down, *i.e.*, first position. When the head becomes visible in the vulva the handles are raised horizontally, *i.e.*, second position. Now the perineum begins to bulge; with this moment, as we know from physiological labor, the head begins its rotation about its transverse diameter, the symphysis forming the fulcrum for the nucha. We imitate this by guiding the handles slowly without traction, and supporting the perineum, toward the maternal abdominal walls, *i.e.*, third position.

Simply supporting the perineum, however, often does not suffice in primiparæ. Here we must rely upon the most gradual dilatation with vigorous repression of the head, and removal of the forceps blades as soon as we can execute the Smellie-Ritgen manipulation, *i.e.*, grasp the brow from the rectum and lift it. Possibly we may require lateral perineal incisions with scissors, which must always be at hand.



In anterior parietal presentations it takes a relatively longer time until the brow is arrested, and finally the broad occiput passes over the perineum, when suddenly the forward rotation around the transverse diameter ensues. But at last backward rotation must follow, so as to allow the face to emerge from under the symphysis.

Accordingly we exert prolonged traction in the first position; then, as soon as the glabella can be palpated behind the symphysis, we immediately change to the third position; lastly, when the occiput is born, the face is guided forward in the second position.

In face and brow presentations the forceps may be applied only when the head is no longer in the pelvic inlet and the chin is anterior. The delivery of the chin, or the brow, from under the symphysis is the first object; hence, in face presentation the forceps are applied in the second position, so as to grasp the parts from the chin to the occiput. On depressing the handles into the first position, the chin is bound to emerge from under the symphysis. Simply and directly elevated into the third position, the forceps aid the face in passing over the perineum.

To the after-coming head the forceps are applied only when the occiput is directed backward and the mouth is not as yet accessible to the manipulations of Mauriceau-Lachapelle and of Wiegand-A. Martin-Winckel. They are applied below the trunk and drawn strongly in the first position until the occiput becomes visible; then in the second and third position.

### *III. Craniotomy, Cranioclasia and Craniotraction, and Embryotomy.*

These operations are performed when the mother's life is in danger, when neither version with extraction nor forceps can be used; when the child is living as an alternative to Cæsarean section, or when the child is dead if craniotomy is safer than the two operations last named.

The conditions for craniotomy are that the os must be sufficiently dilated to permit of perforation, and that the child, thus made smaller, can be extracted through the pelvis. Hence the latter, if generally contracted, must measure not less than 6.5 cm. in the smallest straight diameter (comp. § 22).

Craniotomy—for ethical reasons under anæsthesia—is performed with Naegele's perforator, extraction with Braun's cranioclast or the older two-bladed instrument of Auvard. The latter has recently devised a modification of the cranioclast containing three blades.

The first blade (which Dührssen has provided with a sharp, two-edged point) serves as a perforator, and is introduced under the guidance and cover of two fingers to some suture or fontanelle or to some bone of the skull,\* and forced through. With the scissors-shaped blades the brain is then thoroughly destroyed as far as the base of the cranium and medulla oblongata, and the matter is washed out with three-per-cent carbolic acid or one-per-cent lysol solution, by means of a metallic tube.

\* With the after-coming head the lateral fontanelle is perforated (see Fig. 116) ; in face presentation, the forehead.

Then Auvar'd's first blade is introduced. This and the second blade act as a cranioclast of the usual form. The second blade is introduced like a forceps blade over the brow and face, where it takes a better hold on account of the uneven surface, during the succeeding compression (by the screw at the handle) and traction. Extraction is done slowly and combined with a rotation which turns the face backward when arrived at the pelvic floor. Only when the pelvis is particularly contracted and the head very large and thick the third blade is introduced along the occiput, fitted to the other two blades at the handles, and then by turning the screw the head is crushed as by a cephalotribe.

The reader is cautioned against the ordinary cephalotribe as well as against the sharp hook. Should, however, extraction fail—and even Auvar'd's instrument may not suffice—the forceps of Mesnard-L. Winckel may be used.

The sharp hook, on the other hand, may be employed after exenteration in the same way as Braun's key-hook, by flexing the spinal column, develops the child *conduplicate corpore*, or serves for decapitation, the soft parts being likewise separated and the trunk alone extracted first. This operation is performed in neglected oblique presentation, *i.e.*, with tetanic contraction of the uterus and high elevation of the ring of contraction (the child must be at least seven months old). The hook is carried from the back over the neck and slowly turned against the head until the spinal column is fractured. In place of it, B. S. Schultze's sickle-shaped knife is also used. The retained head is then pressed from without into

the pelvic inlet, brow and face forward, the operator introduces two fingers from the vagina into the mouth and grasps the lower maxilla with the cranioclast, or perforates through the lateral fontanelle, and extracts by combined pressure through the abdominal walls.

Exenteration is resorted to when the foetal trunk is of abnormal size; that is, mainly in pathological formations (cystic kidney, comp. Fig. 139). The abdomen is opened with the scissors-shaped perforator and the contents of that cavity and perhaps also of the thorax are removed. Extremities are amputated in very rare cases, when they prevent embryotomy.





25.A.121

Anatomical atlas of obstetric d1896

Countway Library

BEY0960



3 2044 046 122 875





WOOD'S MEDICAL HAND ATLASES.

---

I.

**Atlas of Ophthalmology and Ophthalmoscopic Diagnosis.**

By PROF. DR. O. HAAB, of Zurich.

102 superbly colored figures, upon 64 plates.

II.

**Atlas of the Nervous System in Health and Disease.**

By DR. CHR. JAKOB, of Erlangen.

221 figures on 78 plates, three of them being folding charts.

III.

**Atlas of Fractures and Dislocations.**

By PROF. HELFERICH, of Greifswald.

166 colored figures, upon 64 plates.

IV.

**Anatomical Atlas of Obstetric Diagnosis and Therapeutics.**

By DR. O. SCHÄFFER.

145 figures in color, upon 56 plates.

V.

**Atlas of Gynæcology.**

By DR. O. SCHÄFFER.

175 figures in color, upon 64 plates.

---

These Atlases will be sold by subscription for the series of five, at \$15.00 for the set.

25.A.121

Anatomical atlas of obstetric d1896

Countway Library

BEY0960



3 2044 046 122 875